



This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

### Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

- + *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.
- + *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.
- + *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.
- + *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

### About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at <http://books.google.com/>

GENERAL EXAMINATION

THE INDIAN OCEAN.



\_\_\_\_\_



Nov-12.















©  
GENERAL EXAMINATION  
OF  
THE INDIAN OCEAN,

BY  
*Charles*  
CH. PHILIPPE DE KERHALLET,  
CAPTAIN IMPERIAL FRENCH NAVY, OFFICER OF THE LEGION OF HONOR, ETC.

TOGETHER WITH  
DIRECTIONS FOR THE NAVIGATION OF TORRES STRAITS

AND  
NAUTICAL DIRECTIONS FOR AVOIDING HURRICANES.  
*By François Antoine Edmond Lelievre*  
TRANSLATED FROM THE THIRD FRENCH EDITION

BY  
*R. H. Wyman*  
R. H. WYMAN,  
CAPTAIN UNITED STATES NAVY.

*U. S.* — BUREAU OF NAVIGATION.  
HYDROGRAPHIC OFFICE.  
*[Publ. no. 274.]*

WASHINGTON.  
GOVERNMENT PRINTING OFFICE.  
1870.



VIII-13

Vol 856

Box 1968.70

1873 Dec 8.  
Gift of Commodore  
R. H. Hyman U. S. N.  
of Washington.

## THE TRANSLATOR'S PREFACE.

---

THE general examination of the Indian Ocean, together with those of the Atlantic and Pacific Oceans, already translated, complete this series on the winds, currents, and navigation of the great oceans by the late Captain De Kerhallet, of the imperial French navy. Compiled from the experience of navigators, and giving a general description of the winds, weather, and currents, as also the most expeditious routes for navigating these oceans in every season, they will be found most valuable to seamen. But little has been added to this work. Since its original publication, the navigation of the Indian Ocean and China Sea has undergone no change, excepting from the more general use of steam and the yearly increasing accuracy of charts, which renders it more secure and less harassing to the mariner.



## TABLE OF CONTENTS.

|                                     | PAGE. |
|-------------------------------------|-------|
| PREFACE TO FIRST EDITION . . . . .  | XI    |
| PREFACE TO SECOND EDITION . . . . . | XIII  |
| NOTE . . . . .                      | XVI   |

### CHAPTER I.

|                         |      |
|-------------------------|------|
| GENERAL WINDS . . . . . | 1-68 |
|-------------------------|------|

(Limits of the Indian Ocean; trade winds; their limits; variable winds between 23° and 60° S.; prevailing winds between 60° and 70° S.; periodical winds or monsoons; their duration; their extent; periods of their change; seasons in India; monsoons east coast of Madagascar and Mozambique Channel; land and sea breezes Indian Ocean; winds east coast of Africa; from Cape of Good Hope to Cape Corrientes; from thence to Equator and to Cape Guardafui; in the Gulf of Aden; in the Red Sea; on the coast of Arabia; in the Gulf of Persia; in the Gulf of Arabia; on the west coast of Hindostan, including Scinde, Guzerat, Concon, Canara, and Malabar; in the Laccadives and Maldives; on the coast of Ceylon; in the Gulf and Bay of Bengal; coasts of Coromandel, Golconda, Orixá, Bengal, Chittagong, Aracan, Ava, Pegu, Martaban, and Tanasserim; in the islands of Andaman and Nicobar; in the Strait of Malacca; Sumatra; the Strait of Sunda; on the coast of Java; at Timor and the Islands of Sunda; in Sea of Timor; on the northwest coast, west and south coasts of New Holland; at the Islands of Mauritius, Rodriguez, and Réunion; hurricanes in the three oceans; undulations and currents of hurricanes. Winds in the seas of passages; designating monsoons in these seas; winds in Java Sea and Moluccas; in the Straits of Bally and Sapy; on the north coast of Java; at Batavia; on south coast of Borneo; in the Carimata Strait, Gaspar and Banca Straits; in the Islands of Bouro, Ceram, and Amboyna; on the west coast of New Guinea; on the coast of Celebes; in the Strait of Macassar; in the Seas of Celebes and Sooloo; in Sea of Timor in Torres Strait. Winds in China Sea; land and sea breezes monsoons in China Sea; winds on east coast of Peninsula of Malay; in the Gulf of Siam; on the coast of Cambodia, at Pulo-Timoan and Pulo-Condore; on the coast of Cochin-China; in the Gulf of Tonquin; on the coasts of China; in the Straits of Formosa; in the Philippine Islands; storms of these islands; winds near Luzon and Palawan; on the northwest and west coasts of Borneo; typhoons in the China Sea.)

## CHAPTER II.

|                            |                |
|----------------------------|----------------|
| GENERAL CURRENTS . . . . . | PAGE.<br>69-87 |
|----------------------------|----------------|

(Traverse current of the Indian Ocean, or counter-current of the Cape of Good Hope; Currents of Australia; equatorial current; southwest branch of equatorial current; west branch, Current of Mozambique; counter-current of Mozambique Current, on west coast of Madagascar; Current of Agulhas; counter-current of the cape; variable currents to north of the Equator in the Indian Ocean; currents in Gulf of Arabia or Oman; in the Red Sea; on the coast of Arabia; in the Persian Gulf; at the entrance of this gulf; on the coast of Persia; Current of the Indus; currents on the west coast of Hindostan; in the vicinity of the Laccadives and Maldives; in the Gulf of Manar; on the coast of Ceylon; in the Gulf of Bengal; in the Bay of Bengal; on the east and west coast of Gulf of Bengal; on west coast of Sumatra; in the Islands of Sunda. In the China Sea; on the coasts of this sea; in the seas of passages.)

## CHAPTER III.

|                                          |        |
|------------------------------------------|--------|
| NAVIGATION OF THE INDIAN OCEAN . . . . . | 88-227 |
|------------------------------------------|--------|

(Classing in four divisions the routes in the Indian Ocean. First division: the great routes, going and returning, numbered from 1 to 12. Second division: navigation of Gulf of Arabia or Oman. Third division: navigation of Gulf of Bengal. Fourth division: route to the China Sea and return; special navigation of the China Sea and its passages. First division: great routes. No. 1, interior or Mozambique route. No. 2, route to east of Madagascar; route from the Cape of Good Hope to the Red Sea and Persian Gulf. No. 3, Boscawen route. No. 4, middle route; routes from the Cape of Good Hope to islands of Réunion and Mauritius, and from thence to the ports of India. No. 5, first outer route. No. 6, second outer route. No. 7, direct route to the Strait of Sunda; details of this strait. No. 8, the eastern route, by Straits of Bally, Lombock, Allass, Sapy, Flores, Aloo, Panthar, Ombay; details of these straits. Routes for return. No. 9, route returning from the Red Sea, Gulf of Persia, or ports of Western India by route No. 1; instructions for doubling the Cape of Good Hope. No. 10, route returning from the west coast of India, from Ceylon or Pondichery to the Cape of Good Hope; routes from Mauritius or Réunion to the Cape of Good Hope. No. 11, route of return from ports of the Gulf of Bengal or Malacca Strait to the Cape of Good Hope. No. 12, route returning from the Strait of Sunda, or those to the eastward, to the Cape of Good Hope. Second division: special navigation of the Gulf of Arabia or Gulf of Oman; routes from the west coast of India to the Red Sea, at every season of the year; from ports situated to northward on this coast; from those situated to the southward; routes from the east coast of India to the Red Sea; the straits of the Red Sea; the Little Strait; the Great Strait; leaving the Red Sea for the Gulf of Persia or the coasts of India; favorable season for going to the Gulf

of Persia; routes from November to February; from March to May; from September to October; southern routes from Bombay to Muscat; June, July, and August; first southern route; second southern route; direct route from Bombay to Muscat during the S. W. monsoon; routes from the Persian Gulf to the coast of India during the N. E. monsoon; in the S. W. monsoon; in September. Third division: special navigation of the Gulf of Bengal; routes from south to north during the S. W. monsoon; routes from the coast of Malabar and ports of Ceylon to Bengal, in February and March; routes from ports of the Coromandel coast to Bengal, during the other months; from the Strait of Malacca to Bengal during the same months; routes from the ports of Ceylon and the Coromandel coast to Bengal, from April to the middle of September; routes from the Strait of Malacca to Bengal, during the same months; routes from the ports of Ceylon or the Coromandel coast to Bengal, from the middle of September to the end of October; route from south to north in the Gulf of Bengal during the N. E. monsoon; routes from north to south in the Gulf of Bengal; route from Bengal to the Coromandel coast from September to March; route from Bengal to the ports of Ceylon, with the N. E. monsoon; routes from Bengal to the Strait of Malacca during the N. E. monsoon; routes from Bengal to the Coromandel coast during the S. W. monsoon; in March and April; the same route passing to east of the Andaman Islands; route from Bengal to the ports of Ceylon during the S. W. monsoon; route from Bengal to the Strait of Malacca during the same monsoon, leaving the Bay of Bengal during the S. W. monsoon; route from north to south in the Gulf of Bengal during the S. W. monsoon; route to be made in this monsoon, on leaving the Strait of Malacca, going west; general directions for navigation in the Gulf of Bengal, according to the season; routes from the east coast of the Gulf of Bengal to the west coast during the S. W. monsoon; northern route, at the end of June and the middle of August; southern route during S. W. monsoon; in May, the first part of June, the end of August, and commencement of September; route at this period for the Gulf of Persia, the Red Sea, Bombay, Mahe, &c.; general remarks; route from the ports of the west coast of the Gulf of Bengal to Rangoon during the N. E. monsoon; during the S. W. monsoon; route from Rangoon to ports of the Gulf of Bengal during both monsoons; routes from the Coromandel coast to Mergui, from the 1st of March to the middle of September; route from Mergui to the Coromandel coast in both monsoons; route from Pondichery, Madras, Acheen, &c., to the Strait of Malacca, in both monsoons; routes from the Strait of Malacca to the west coast of the Gulf of Bengal and the west coast of India during the N. E. monsoon; routes from the ports of India to the Strait of Sunda in both monsoons; routes from the ports of India to the eastern straits; return from the Strait of Sunda to the ports of India in the S. W. monsoon. Fourth division: the China Sea and the seas of passages; general remarks on the routes to China; routes from the Cape of Good Hope to China with the S. W. monsoon; direct route; interior route; outer route; details of this last route;

route of Palawan; route of the Strait of Malacca to the Moluccas in the S. W. monsoon; first eastern route to China during the N. E. monsoon, October and November; second eastern route to China in December, January, and February, by Pitt Strait, Strait of Dampier or Gilolo, to enter the Pacific Ocean; route from Dampier Strait to that of Formosa and China; great eastern route from the Cape of Good Hope to China during the N. E. monsoon; details of the inside route from Macao to Pulo-Aor passing to the west of Pulo-Sapata; to the east of Pulo-Sapata; route from Pulo-Aor to the Strait of Banca, Gaspar, &c.; outside route from Macao to Pulo-Aor. Route returning from China to Bengal during the S. W. monsoon, in passing through the Strait of Malacca; first route to the east; return from China to the west coast of India, or to Europe, April and beginning of May; Straits of Mindoro, Basilan; Strait of Macassar; Strait of Sunda; route from the Strait of Basilan to Strait of Ombay, taking the Macassar Strait; taking the Moluccas Channel; route from Basilan Strait to the Strait of Ombay, passing through those of Patience and Bat-chian; second eastern route, by entering the Pacific Ocean; return from China to Europe; to the east or west coast of India; Straits of Gilolo, Dampier, Ombay, and Salayer; route from the Strait of Salayer to Bengal by the Java Sea; by the Carimata Passage, and by the Strait of Malacca; passage by the Straits of Sapy and Allas going to Europe; special navigation of the China Sea, with and against the monsoon; N. E. monsoon, going from north to south in the China Sea; route from Pulo-Aor to the Strait of Carimata and passage from this Strait; route from Pulo-Aor to Gaspar Strait; passage of the China Sea from south to north during the S. W. monsoon; route near the coast for damaged vessels; route to the east passing by the middle of the China Sea with the S. W. monsoon, at its end, or at the commencement of the N. E. monsoon; route of Palawan; same route from the middle of November to February; route going up the China Sea during the strength of the N. E. monsoon, with a steamer; route for a steamer to Hong Kong or Macao; going down the China Sea against the S. W. monsoon; at the end of the S. E. monsoon; routes from the eastern straits to Singapore by the Carimata Passage; the route called the northern route, southern route, eastern route, between these points; route to the east of Amboyna or the Moluccas by the Strait of Malacca and for India during the N. W. monsoon; same route by the south during the S. E. monsoon; special navigation of the Gulf of Siam; route for leaving the Gulf of Siam in both monsoons; route from Pulo-Oby to Manilla; route from Macao to Manilla in both monsoons; routes from Manilla to Macao; route from Pulo-Sapata to Manilla during the S. W. monsoon; route from Manilla to Pulo-Aor during the N. E. monsoon; route to the Gulf of Tonquin; navigation on the east coast of China from Macao to the Islands of Chusan, during the N. E. monsoon; port of Amoy; same route passing to the east of Formosa; routes from India to the ports of the east coast of New Holland during both monsoons; return from these ports to India; route to the south from September to March, route to the north, by Torres Strait, from September

## CONTENTS.

IX

to March; navigation of Torres Strait; inner route; outer route; general remarks; route for Torres Strait from India; N. W. monsoon; routes by steamer; Singapore to Port Jackson, &c.; Carimata Passage; southern route, taken during easterly monsoon; northern route, during westerly monsoon; southern route in Java Sea; northern track in Java Sea; Salayer Strait; Pulo-Cambing; Endeavor Strait; Entrance Island; Prince of Wales Channel; Bligh Channel; The Sisters; Stephen's Island; route from the east to cross Torres Strait for Bligh Channel; Eastern Fields and Portlock Reefs; Anchor Cay; Bramble Cay; Darnley Island; tides; route from Cape York leaving the Great Barrier by the Raine Island Channel; routes from Sidney to India; inner route; directions for Raine Island Entrance, Blackwood Channel; Northern Passage; North Channel; openings between latitude 12° 30' S. and Raine Island; Pandora Entrance; Papuan or Great Northern Channel; track of the *Astrolabe* and *Zélée* through Torres Strait; Stead's Passage; route to Port Jackson; to India through Pitt Passage; March to September; September to March; eastern routes to China from ports of New Holland; N. W. monsoon; first eastern route; second eastern route.)

## APPENDIX.

|                                                       | PAGE.   |
|-------------------------------------------------------|---------|
| NAUTICAL DIRECTIONS FOR AVOIDING HURRICANES . . . . . | 229—238 |
| ALPHABETICAL LIST OF PLACES . . . . .                 | 239—265 |

## MAPS.

- No. 1.—Winds, following Chapter I.
- No. 2.—Currents, following Chapter II.
- No. 3.—Routes Sailing Vessels, following Chapter III.
- No. 4.—Routes Steamers, following Map 3.





## PREFACE TO THE FIRST EDITION.

---

It is our desire, in this work, to describe in a concise and general manner the winds, currents, and navigation of the Indian Ocean. We are of opinion that it will be found useful to seamen as a sequence of the examination of the Atlantic Ocean, and a summary of all the most important information for the navigation of the seas of India.

The details belonging to particular localities must not be expected here; for such we refer to special sailing directions, among which we would mention the *Instructions sur la Navigation des Mers de l'Inde*, by D'Après de Manneville, the *India Directory*, by Horsburgh, and the *Tableau des Vents et des Courants*, by Romme.

PARIS, October 15, 1851.



## PREFACE TO THE SECOND EDITION.

---

SOME of our comrades, and many officers of the commercial marine, have expressed to us their regret at not having found in the *General Examination of the Indian Ocean*, as in that of the Atlantic and Pacific Oceans, remarks upon the prevailing winds on the coasts which form its basin. We have, in answer, pointed out some of the works in which this information may be found. To this they have objected that, in general, seamen can carry but few books; that it is difficult for them to make researches, which most frequently lead only to special results, when they require general rules; that, without losing sight of the object which we proposed to attain, we should increase the limit of our discussion of the Indian Ocean; and, lastly, we were informed that more complete observations on the winds, and more extended directions regarding the routes in this sea, would be well received, if methodically presented. These remarks have appeared to us well-founded; in response, we cannot do better than to fill the chasm indicated, hoping that seamen will not complain of the considerable increase in the size of the work, resulting from this decision, which we have taken after much hesitation.

We have remodeled almost entirely our first edition of the Examination of the Indian Ocean, in order to introduce the new matter spoken of. To that end we have consulted ancient as well as modern voyages; the work of Romme, which has but the fault of being too diffuse and not sufficiently general; the *Instructions sur la Navigation des Mers de l'Inde*, by D'Après de Mannevillette, a work too much neglected, replaced advantageously by Hosburgh's *India Directory*, but with the undisputed merit of having served as a base and model to the work of the celebrated English captain, from which we have borrowed largely; the *Mélanges* and *Annales Hydrographiques*, publications; the utility of which have long been recognized; the *Nautical Magazine*, a work of similar character to the former, &c. Finally, we have added to these whatever we have gathered from the isolated reports of English and French captains. We

have thus been able to deduce the laws most generally observed by the winds and currents, and the rules for the navigation of the Indian Ocean and China Sea.

"In the Indian Ocean and in those seas bordering on it," says the illustrious Admiral Krusenstern, "the importance which should be attached to a knowledge of the winds and currents can be readily understood, for it is rarely possible to surmount these two obstacles when united, as is frequently the case in these seas. It will be a convincing proof of the necessity of this information, if it is considered that, according to the duration of the favorable monsoon, each month may render necessary the choice of a new route. There are instances of ships detained a whole year in these seas from the want of experience of their captains. I have seen, among others, a ship, detained too late at Batavia, make two fruitless attempts to reach China by the eastern route, and the result was that she was constrained to await the return of the southwest monsoon to complete her voyage, thus losing an entire year."

As we have said in our first preface, no detail will be found in the *General Examination of the Indian Ocean*. For special directions and for the local navigation it will be necessary to have recourse to the special works which treat of this sea, and particularly to that of Captain Horsburgh.

To complete this work we have added two important appendixes, the first giving the navigation of Torres Strait and near the east coast of Australia;\* the second, the maneuvers to be made (when such are possible) when enveloped by a hurricane.

In the first appendix will be found the directions of Captain King, translated for the first time; those of Blackwood and Yule, which were translated by M. Darendeau for the *Mélanges Hydrographiques*, besides many other documents published at different times in the *Nautical Magazine*. We have, in arranging these different documents, taken them verbatim. The directions which they give are as complete as the present knowledge of this dangerous navigation permits, as yet but partly explored, excepting the portions surveyed by the English captains just mentioned, and those visited by Admiral Dumont d'Urville. We hope that it will be useful to seamen, and that it may facilitate, at any rate, their passage from the Indian to the Grand Ocean and *vice versa*.

---

\* This appendix has been introduced into the body of this work.

The second appendix completes the subject of hurricanes, by giving to seamen the nautical directions by which they should be governed when compelled to strive against these formidable atmospheric disturbances. We owe this important work to M. Keller, to whom we are happy to be able to express our thanks. This learned hydrographic engineer has not only authorized us to borrow from his first memoir of 1847, but he has obliged us by giving an extract on the same subject from an unpublished memoir. The nautical directions given by M. Keller, deduced from a profound study of these phenomena and the laws that govern them, are both simple and clear. In conforming strictly to them, where a maneuver is yet possible, there is a certainty of removing further from the danger and of seeing it diminish gradually, with every chance of escaping the lot of a great number of ships which, as the corvette *Berceau*, have left no other trace of their destruction than a painful remembrance.

We have adopted, for the orthography of the names of places in the Indian Ocean, that of the atlas compiled by M. Daussy, hydrographic engineer-in-chief of the marine, and published in 1840.

Our aim has been to make the study of the navigation of the seas of India and China easy to seamen, and we shall be repaid for the labor and research which this work has cost us, should it prove of utility to them.

CHARLES PHILIPPE DE KERHALLET.

PARIS, *July 6*, 1853.

---

[The third edition was published without any change or modification of the second edition.]

## N O T E.

---

WE give to the winds the name of the point of the compass from which they blow ; to the currents, that of the points of the compass toward which they run.

The direction of the winds, that of the currents, the courses, the trend of the land, and the bearings, are corrected for the variation of the magnetic needle, except when otherwise stated.

# GENERAL EXAMINATION OF THE INDIAN OCEAN.

## CHAPTER I.

### GENERAL WINDS.

The Indian Ocean is bounded on the north by the southern shores of the countries of Asia; on the east it is separated from the Pacific Ocean by the Indian Archipelago; the east coast of Africa forms its western limit; and its generally received southern boundary is a line drawn from the Cape of Good Hope to Bass Strait, formed by the coasts of Australia, or New Holland, and Van Diemen's Land, or Tasmania.

Limits of the Indian Ocean.

The form of the land surrounding the basin of this ocean prevents that regularity in the currents of the air and ocean which is found in the Atlantic.

In the northern hemisphere of the Indian Ocean, and even in a part of the southern, the trade-winds are not found; they only exist between the parallels of  $10^{\circ}$  and  $28^{\circ}$  south latitude from the west coast of Australia to a meridian a few degrees to the east of Madagascar.

Southeast trade-winds in the Indian Ocean.

The polar limit of the S. E. trade-winds is subject to variations due to the temperature; according to the season, they are found more to the north or more to the south by  $2^{\circ}$  or  $3^{\circ}$ , as the declination of the sun is north or south. From the same cause the equatorial limit of the zone of these winds is nearer to or further from the Equator, which it sometimes reaches.

Limits of the southeast trades.

It is remarked that if the sun is in the northern hemisphere, and at its greatest distance from the Equator, the trade-winds have a tendency to blow more from the S., vary-



ing from S. E. to S. S. E.; on the other hand, when the sun is in the southern hemisphere, the winds take an easterly direction, and vary from E. S. E. to E., and even to E. N. E.

From the parallel of  $10^{\circ}$  S. to the coast of India there are, in the Indian Ocean, periodical winds. In this sea the trade-winds are not regular, except at a great distance from the coasts, as the continents and large islands oppose the formation and regular course of the atmospheric currents.

Variable winds of the zone comprised between the parallels of  $28^{\circ}$  and  $60^{\circ}$  S.

South of the parallel of  $28^{\circ}$  S. is the zone of the variable winds. In this region, comprised between  $28^{\circ}$  and  $60^{\circ}$  of S. latitude there is a continual strife between the lower currents of air directed from the Pole toward the Equator and the upper currents directed from the Equator toward the Poles. These last, occasioned by the trade-winds, have been called, as we have already stated, (in the General Examination of the Atlantic Ocean,) the tropical currents. This strife, in which the tropical wind has generally the advantage, makes the winds in this zone very variable.

In the southern hemisphere of the Indian Ocean, as in the same hemisphere of the Atlantic, the prevailing wind, in the zone of which we are speaking, is N. W.; that is, throughout the year the wind will be found for the greater number of days from this direction.

The prevailing winds in the zone comprised between the parallels of  $60^{\circ}$  and  $70^{\circ}$  S.

It may be said that in general, in the zone comprised between the parallels of  $60^{\circ}$  and  $70^{\circ}$  S. latitude, the prevailing winds during the summer are from the southward, and during the winter from the westward.

Periodical winds or monsoons of the Indian Ocean.

The trade-winds which blow fresh on the Atlantic Ocean to the south of the Equator, and sometimes even nearly to the latitude of  $6^{\circ}$  N., are, as we have before said, interrupted in the Indian Ocean by the configuration of the land in its N. E., N. W., and E. portion.

The influence of these lands, together with the difference which constantly exists between the temperature of these continents and the sea in their vicinity, occasions the wind known as the *monsoon*.\*

Monsoons exist in many parts of the globe, but in no sea do they blow with so much regularity, so freshly, or are so well established as in the Indian Ocean, especially in that portion of it to the north of the Equator; there they extend from the coast of Africa to beyond the China Sea, and even penetrate a considerable distance into the Pacific Ocean;

\* Name derived from the Arabic *mausim*, or season.

they, are, however, in the northern part of the China Sea, and more to the eastward, less regular than in the Indian Ocean.

In general the monsoons blow during the summer toward the continents, and during the winter in the opposite direction; thus the S. W. monsoon, which blows in the northern part of the Indian Ocean, from the month of April to October, corresponds to the seasons in which the sun, having attained his greatest northern declination, has heated the soil of India; while, during the winter of this hemisphere, when the sun is in his southern declination, the N. E. monsoon prevails.

The monsoon blows in one direction during one-half of the year, from the middle of April to the middle of September; from the middle of October to the middle of March it blows from an opposite direction.

In the northern part of the Indian Ocean the S. W. monsoon commences at the middle of April and ends at the middle of September. The N. E. monsoon succeeds it, and lasts from the middle of October to the middle of March; the S. W. monsoon brings rain and bad weather. The wind also blows stronger than during the N. E. monsoon, when the sky is generally clear and the weather fine.

The zone where the S. W. and N. E. monsoon, prevail is comprised between the Equator and the Tropic of Cancer; it extends from the east coast of Africa to the coast of India and China, and to the Philippine Islands; and their influence is often felt in the Pacific Ocean as far as the vicinity of the Mariana or Ladrone Islands, that is to 145° E. longitude; to the northward they prevail at times as far as the islands of Japan.

The limits of the monsoons are not always the same, and their change does not always take place at the same period.

It is observed that in the Bay of Bengal the winds are more variable in force and direction than in the Indian Ocean, where gales of wind seldom fail at the changes of the monsoons. It is also observed that in that portion of the Sea of India exposed to the influence of the monsoons, the winds haul more to the S. in the vicinity of the coast of Africa, and are more to the W. on the coast of India, during the S. W. monsoon.

To the south of the Equator the S. E. monsoon commences at the middle of April, and ends at the middle of September;

Duration of the monsoons.

S. W. and N. E. monsoon.

Extent of the zone occupied by the S. W. and N. E. monsoons.

Monsoon, S. E. and N. W.

the N. W. monsoon, variable to W. S. W., replaces it, commencing at the middle of October and lasting until the middle of March; this last monsoon is the period of sudden squalls and bad weather.

Extent of the zone occupied by the S. E. and N. W. monsoons.

In the Indian Ocean the S. E. and N. W. monsoons blow in a zone comprised between the Equator and the parallels of  $8^{\circ}$  or  $9^{\circ}$  S. latitude; but on the coast of Australia, and in the western part of the Pacific, this zone extends as far as the parallels of  $12^{\circ}$  and  $23^{\circ}$  S. latitude. It commences near the coast of Africa, and terminates on the meridian of the Pomatou Group and that of Nuka-hiva, situated in the Pacific in nearly  $140^{\circ}$  W. longitude. The S. W. monsoon blows rarely with force or regularity, excepting during the months of December and January, a period when it occupies, sometimes, a zone comprised between the parallels of  $10^{\circ}$  or  $12^{\circ}$  S. latitude, and  $2^{\circ}$  or  $3^{\circ}$  N. latitude. This monsoon is, besides, subject to many irregularities; as it approaches Sumatra its northern limit is at a greater distance to the south of the Equator, and between it and the Equator is a belt of variable light breezes and calms.

The S. E. monsoon, which is the fine season to the south of the Equator, might be regarded as an extension of the S. E. trade-winds, which, when the sun is near the Tropic of Cancer, blows as far as the Equator. The S. E. and N. W. monsoons have more force and regularity in the Java Sea, the Sea of Timor, and among the Moluccas, especially near New Guinea. These monsoons are found on the north coast of Australia, between Melville Island and Cape York, as also in Torres Strait, where the N. W. monsoon commences at the end of October. In these seas they are often named the E. and W. monsoons.

Changing of the monsoons.

The change takes place gradually, and is almost always accompanied by squally and tempestuous weather; to the south of the Equator, however, at the change of the monsoons, though the weather may be at times bad, the wind is never violent.\*

When the monsoon is about terminating, the highest clouds are observed taking a direction opposite to that of the wind, and this some weeks even before the change is perceptible in the lower regions of the atmosphere. The monsoons penetrate far into the interior of the countries which bound the Indian Ocean on the north, their direction

\* D'Après de Manneville; *Instructions*, &c., p. 40, edition 1819.

being modified by the form of the coast, the islands, chains of mountains, or other causes.

The direction of the monsoons produces in India the dry and rainy seasons. The rainy season of the west coast corresponds with the S. W. monsoon, and that of the east coast with the N. E. monsoon; that is, the winds from the sea generally produce rain, while those from the land bring fine weather.

It has been already observed that the S. E. trade-wind does not extend as far as the coast of Madagascar. On its east coast, and in the channel which separates it from the coast of Africa, the monsoons are regularly established.

On the east coast of Madagascar the N. E. monsoon, varying to N. N. E., blows from November to April, and the S. E. monsoon from April to November, which is the dry season, with fine weather. In the southeast part of Madagascar, however, winds are generally found from the N. E., which, hauling round the coast, blow as far as Cape St. Mary; to the west of this cape, and near the southwest coast of Madagascar, they turn to the S. E. and S., and blow during the year, but do not reach far to the north along the west coast of this island. At Madagascar there are no land and sea breezes; the only winds throughout the year are the prevailing winds just mentioned and those of the Mozambique Channel, to which we shall presently allude. These winds rise at 8 h. or 9 h. in the morning, and freshen to noon, when they are quite strong; they remain thus until 3 h. after noon, and gradually die away toward sunset.

The general remark may be made on the winds which prevail in the vicinity of islands situated in the zone of the trade-winds, that these winds are nearly always weaker during the night than in the day.

In the Mozambique Channel, and principally from the parallel of the Bay of Sofala to the Equator, the S. W. monsoon commences in April and ends in November; this monsoon is the fine season. The winds at the entrance of the channel are generally from S. to S. S. W., hauling to the westward as you proceed north, and at last unite with the W. S. W. and S. W. winds, which blow at this period to the north of the Equator. During this season in the northern part of the channel, the winds vary from S. W. to S. E. and E. S. E., and near the southern extremity of Madagascar they often blow very fresh from S. E. to E. Near the coast

Seasons in India.

Monsoons on the coast of Madagascar. East coast.

Monsoon N. E. variable to N. N. E. S. E. monsoon.

Monsoons in the Mozambique Channel. Monsoon from S. W. to S. S. W.

of Africa the land breezes are frequent. In the middle of the channel the winds are more regular, and follow nearly its direction.

N. E. and N.  
W. monsoons.

During the other months, from November to April, in the same part of the sea, as far as the northern extremity of Madagascar, the wind blows fresh from N. E., accompanied by rain and squalls; between this island and the point of Mozambique, and to the southward as far as the Tropic of Capricorn, during this monsoon, the winds are variable from N. E. to N. W., hauling by the N. in bad weather. In the Mozambique Channel this is the rainy season.\*

When the N. E. monson, variable to N. W. in the Mozambique Channel, meets the winds from S. to S. E., which blow fresh in this season in the vicinity of the southern extremity of Madagascar, and ascend to the north in a part of the channel, the shock of their meeting occasions violent and sometimes rotary storms.

The meeting of the N. winds with those from the S. E., S., and S. W., which blow with equal regularity to the south of the Tropic of Capricorn, at times produces the same results.

Land and sea  
breezes.

As in other seas, the land and sea breezes are found on some of the shores of the Indian Ocean. These breezes, in general, extend but a short distance from the land. The sea breeze prevails during the day, the land breeze at night.

They blow principally at the period of the change of the monsoons, and during the months when this change takes place; when the monsoon has acquired force and regularity these alternate breezes cease almost entirely.

However, during the fine season on the coast of Malabar, from September to April, the E. wind blows from the land toward midnight, and continues until 10h. or 11h. in the morning, extending to seaward sixty miles.†

On the whole coast of India the land breeze, when it exists, rises toward midnight, and the winds from the sea blow from mid-day to night. When they continue after sunset they are generally moderate and often weak.‡

Following these general considerations, we will indicate in detail the prevailing winds near the coasts which bound the Indian Ocean. Commencing at the Cape of Good Hope,§ we will follow the coast to Bass Strait.

\* D'Après de Manuevillette. † Horsburgh. ‡ *Nautical Magazine*.

§ See *General Examination of the Atlantic Ocean: Winds of Cape of Good Hope, Agulhas Bank*.

From October to April the winds blow fresh from S. to S. E. along the coast of Africa, from the Cape of Good Hope as far as Cape Corrientes, and they often extend as far as the Equator.\* Winds on the coast of Africa from the Cape of Good Hope to Cape Corrientes.

From May to October on this coast the prevailing winds are from W. to N. W. for ninety miles in the offing. These winds are only found between the Cape of Good Hope and Cape Corrientes.† During the month of May the winds are light and interrupted by calms. The N. W. winds are the strongest and bring rain. They are violent in June, July, and August. In the vicinity of the Agulhas Bank, as in the greater part of the southern hemisphere, the mercury rises with the winds from the S., and falls with those from the N.

From the Bank of Agulhas as far as the meridian passing through the southern extremity of Madagascar, violent gusts of wind occur during the winter, accompanied by thunder, lightning, and heavy rain.

On the coast between Cape Corrientes and the Equator the monsoons of the Channel of Mozambique, before mentioned, prevail. The land and sea breezes are also found there; the seasons are very uncertain, the winds variable, and gales frequent at every period of the year, but principally during the N. E. monsoon, varying to the N. W. from November to April. The fine season extends from April to October with the ruling winds from the S. to the S. S. E. and S. S. W. Winds on the coast between Cape Corrientes and the Equator.

On the coast between the Equator and Cape Guardafui, the S. W. monsoon, or the wind from W. N. W., varying to S. W., according to the position on the coast, commences to blow in the first part of March. The N. E. monsoon succeeds it after six months, (October to March.) These monsoons are established earlier near the coast than at sea. They commence also near the Equator before they do at Cape Guardafui. The N. E. monsoon is seldom strong near the coast.‡ Winds on the coast between the Equator and Cape Guardafui.

From October to January the winds are variable, and often blow successively from every point of the compass. The prevailing winds are from the N., bringing rain, and are at times violent. From October to January.

From January to May they blow fresh from N. E. and N. N. E. with fine weather. Toward the end of March, From January to May.

\* Nicholson.

† Dampier.

‡ Romme.

near the coast, the winds from S. W. are felt, which spread to seaward. In this month there are frequent whirlwinds in the vicinity of Cape Guardafui.

From May to  
October.

From May to October the winds blow from the southern quarter and during July, August, and September there are calms near the coast, while at a distance of three hundred miles from it the winds are fresh from the S.

There are also during these months, near Cape Guardafui, strong winds which do not extend more than thirty miles to sea; at this distance the weather is fine and the sea smooth.

Land and sea  
breezes in Feb-  
ruary and March.

On the whole length of the east coast of Africa, during the month of February and the first part of March, the alternate land and sea breezes are found. They cease as the S. W. monsoon gains force. They re-appear in the month of October, when this monsoon grows light; they are not then so fresh or so regular as at the end of the other monsoon.

Gulf of Aden.  
January, Feb-  
ruary, March.

In the Gulf of Aden,\* that is, in the sea between the meridian of Ras-Aseir, generally known as Cape Guardafui, and that of Babel-Mandeb, generally during the months of January, February, and March the winds are from E. to E. N. E., which increase gradually in force from Cape Aden as they approach the strait; the weather during these months is fine and usually clear; at this season the trade is carried on in vessels of from fifty to three hundred tons.

April, May.

During April and May the wind is most frequently light, varying from E. N. E. to S. E. and S. Near the coast the weather is clear; at times, however, the sky is overcast and the horizon hazy, and there are land breezes commencing at 4 in the morning and ending at 8 a. m. Very rarely there are winds from the W., which, exceptionally, are strong. In the month of April there are light rains, but they seldom continue more than three days. During the night the dew is very heavy.

June.

In June the weather is very uncertain and the wind variable; though at times clear it is more frequently hazy. In the morning it is calm, or very light breezes, increasing sometimes to noon, and blowing quite fresh from S. they cause a heavy swell on the coast of Arabia. Toward the middle of this month, between Burnt Isle or Mait and the

---

\* Captain S. B. Haines, East India Company. *Journal of the Geographical Society, London*, vol. ix, p. 125, from which we take the following remarks.

strait, the winds are strong from the W., which enable ships leaving the Red Sea, bound to India, to reach the monsoon.

During July and August nearly the same weather is encountered; it is nearly always hazy, and clear days are rare. At times there is for two or three days in succession a very thick mist.

July and August.

From the mean of six years' observations, out of sixty-two days, there were twenty in which the winds were from the S., fresh or moderate during the day and light at night. They occasion a heavy swell which rolls on the coast of Arabia. During the remaining thirty-eight days the winds were very fresh from W. and S.W. During the two months of which we speak, there are at times in the strait passing showers, with heavy dew during the night.

Sometimes toward evening, when the wind from the S. dies out, there is a violent squall from the land, which is announced sufficiently beforehand by a thick cloud of sand or very fine dust, to enable all precautions to be taken.

In the month of September the W. winds cease and are replaced by the land and sea breeze. During the night it is generally perfectly calm.

September.

At the commencement of October the weather is nearly the same, with occasional light rains.

October, November, and December.

At the commencement of November the N. E. monsoon, which reached Makallah about the 5th of November, increases by degrees and blows fresh at the full and change. During three months the winds generally vary from E. to E. N. E.; from observations for four years it is stated that from the 27th of December to the 3d of January the weather was always threatening, and that there was a storm accompanied by heavy rain. To the south of the Red Sea the S. W. monsoon of the Indian Ocean blows from the southward; this direction, however, is changed by the mountains of Arabia. Outside of the strait the monsoon blows from the W. and it rarely passes Aden. At Cape Guardafui it blows very fresh from N. N. E. near the coast, then the breeze penetrates into the Gulf of Aden as far as Ras-Rhemat, a cape to the southwest of Makallah. It is generally on this line that ships from the Red Sea bound east take the monsoon.



## RED SEA.

The following remarks on the Red Sea are taken from Captain Rogers, and are part of the sailing directions for this sea by Captains Moresby and Elwon.

October to  
April.

From the commencement of October to April, which is the winter season, it can be said that the winds blow constantly from the S. between the Straits of Babel-Mandeb and Jibbel-Teer, situated in latitude  $15^{\circ} 30'$ ; at the epoch of the syzygies they are interrupted for one or two days by winds from the N.;\* sometimes, however, there is no change of wind for two entire months. From Jibbel-Teer† to the parallel of  $19^{\circ}$  or  $20^{\circ}$  N. latitude the winds are variable during this season and are as frequently from the N. as from the S., the one or the other of these winds prevailing in proportion as the limit of either is approached.

From the parallel of  $21^{\circ}$  to  $27^{\circ}$  N. latitude the prevailing wind during this season is from the N. It is rare, however, that two weeks pass without one or two days of southerly wind; this takes place more especially from the end of November to the commencement of March. From the parallel of  $27^{\circ}$  N. to Suez, the wind is almost invariably from N., seldom interrupted by a southerly wind, except in December, January, and February. The wind from N. W. seldom blows with violence longer than twelve or fifteen hours, and it is stronger in winter than in summer.

June to Sep-  
tember.

From June to September the wind blows from the N. without interruption and with more or less force through the whole extent of the Red Sea, from Suez to the Strait of Babel-Mandeb. Principally in August and September it varies near the land. During these months a good sailing ship will make thirty-five miles per day in working between Mocha and Suez. In June, July, and August the wind in the Red Sea is stronger during the night than in the day.

In that portion of this sea, called the Sea of Suez, a misty horizon is generally an index of wind; it is not, however, a sure sign. The same remark applies to little fleecy clouds over the mountains of Toor or Sinai which are seen from

\* Other navigators, D'Après de Manneville, Malham, Moresby, say that the S. winds prevail in the southern part of the Red Sea for two-thirds of the year, that is, from October to May or June, then the winds blow from the N. for four months.

† We believe that Jebel-Teer would be more correct.

the south entrance of the Strait of Jubal. During the winter months, through the entire extent of the Red Sea, the wind from N. brings dry and that from S. moist weather. A change of wind is often thus announced several hours beforehand without any other sign. During the summer months the atmosphere is generally moist throughout the Red Sea; at the zenith, however, the sky is very clear. The wind blows seldom in squalls in this sea; however, it comes very quickly sometimes from the northward.

It takes each monsoon a month to become regularly established. At Mocha, from September to May, the wind varies from E. S. E. to S. E. by E., and from the commencement of April to the end of August it is frequently S. S. W. and S. W.\*

During the months of November and December, on the coast between Mocha and Aden, the winds are very strong; in June and July they are variable and moderate.

The rainy season in the Red Sea is from April to September.†

The N. E. monsoon, as it penetrates into the Red Sea, becomes S. E., and the wind, repelled by the high lands of Africa, in a narrow strait, gains considerable force and inclines slightly toward the coast of Arabia. It is probable that it is stronger on this coast than upon that of Abyssinia, even in the lower part of the Red Sea. It commences to decrease in strength toward the parallel of 14° N. latitude, and in proportion as the broadest part of the sea is approached it becomes by degrees a light breeze, turning to the west of the banks and islands of the coast of Africa, blending by degrees with the winds from the N. which exist in these localities.

On the south coast of Arabia, extending beyond the Gulf of Aden—that is, to the west of Cape Guardafui as far as Ras-el-Gat‡—in December, January, and February, and during the first fifteen days of March, the N. E. monsoon blows along the coast in a direction depending on the bend of the shore. At sea it varies from N. E. to E. by S.; the weather is fine and clear, and there are neither squalls nor rain.§

The same winds are felt on the whole extent of this coast, except on the part comprised between Ras-Segar and Ras-

The South coast of Arabia.

Bay of Koorya-Moorya.

\* Malham.

† Horsburgh, 2d edition, p. 549.

‡ Ras in Arabic signifies cape.

§ Captains Haines and Saunders.

Karwan; and also in the great bay of Koorya-Moorya, the weather differs much from that found on the other parts of the coast; the changes of wind here are very sudden, and its force is often to be feared, as there is no notice given of these sudden shifts. A cloud appears on the mountains of the bay, the sky, from being clear and serene, becomes at once overcast, and in five minutes it blows with violence from the north. The Arabs call these winds the *belaats*, and they are much dreaded by them.

*Belaats.*

During these *belaats* one wind succeeds another at an interval of eight or ten days—always blowing very strong, and at times a gale—blowing by squalls varying from N. N. E. to N. N. W. These winds never last a less time than three, and often for seven, and even ten days.

The *belaats* are equally dangerous for ships near the coast. Sometimes toward the evening the wind fails entirely, and it is calm for one or two hours, when violent squalls blow from the mountains, at intervals of a few minutes, without any other indication than the whistling of the wind and the noise of the sea. These squalls are sufficiently heavy to endanger a ship under much sail, by carrying away her masts or splitting her sails. They last for five or six hours, succeeding each other at greater or less intervals.

The *belaat* is often replaced by strong winds from the S. E., which occasion a heavy swell. At other times, in this bay, there are heavy gusts of wind from the S. S. W., which last often five days in succession, and are very dangerous, as they blow toward the coast.

The winds from the N. do not extend far to seaward, and do not appear to prevail on the coast of Arabia, except in the localities we have indicated. After they have passed the bay of Koorya-Moorya, they follow the direction of the coast, and are influenced by the high mountain chain of Subban.

The winds from the S., also, do not appear to blow on this portion of the coast of Arabia; they are rarely felt on that to the southward, and the S. W. monsoon does not arrive at Socotra until from the 1st to the 10th of May. There are then heavy rains. The S. W. monsoon must not be confounded with the breezes from S. S. W., which may be found in February and March.

*April.*

From May to April the winds are light and variable on this whole coast, and have a tendency to the southward.

The land and sea breezes then blow; the sky is generally clear at this season, and the night dews are heavy.

During the month of May the weather is uncertain; and when the monsoon is early, it blows fresh from S. W., with fine weather. May.

In June, July, and August the S. W. monsoon is in full force. It is more frequently very strong in July. The passage from the Red Sea or the Gulf of Persia is made at the commencement of June, though some prefer not to start until the last of August, when the strength of the monsoon has passed. June, July, and August.

In September the winds are moderate, varying from W. to S. The Arabs call these winds *damauro*. They last from the 1st of September to the establishment of the N. E. monsoon. September.

During the month of October the winds are light and variable, with frequent calms. Near the coast there are land breezes, and sometimes they alternate with the sea breeze. During the night the sky is cloudy, and there are at times showers. October.

From the 18th to the 20th of November the N. E. monsoon usually arrives on the south coast of Arabia. After this period the winds follow the direction of the coast; that is, they blow between N. and E. Before the monsoon the weather is the same as in the preceding month, with about the same rain. Entire confidence cannot be placed in the regularity of the seasons on the south coast of Arabia. Sometimes at the same period in different years the winds are altogether dissimilar. Besides, on the whole of this coast, principally where the land is low, the wind is influenced by the sun and the variations of the atmosphere. This influence acts even on the strongest breezes. November.

Thus, to the northeast of Ras-Tartak, the N. E. monsoon lasts often only three months, during a part of November, December, January, and a part of February. The S. W. monsoon generally terminates toward the middle or end of August, and ships leave for the Red Sea at the commencement of September. In March the S. winds are at times very fresh to the E. N. E. of Ras-Tartak, especially in the bay of Koorya-Moorya. April and May are regarded by the Arabs as a separate season, which they name *bayn-el-autern*. The winds then are variable, and principally from the S., so that vessels go in every direction. Most all

those vessels which go down the coast at the commencement of the N. E. monsoon return during this month.

East coast of  
Arabia, between  
Ras-el-Gat and  
the Strait of Or-  
mus.

In the month of August, when the wind is fresh from S. W. to the south of Ras-el-Gat, it is found that it turns successively, and that to the north of the cape it is S. E. From the cape to Muskat the winds are variable, and the alternate land and sea breeze blows. Sometimes a N. W. wind from the Gulf of Persia extends to the vicinity of Muskat, and the S. E. winds blow casually for some days.

In September, and from this month to the end of March, the prevailing winds are from the E., and moderate. It is very seldom that there are violent winds at this season. However, when the W. winds alternate with those from E. they are fresh at this period.

The S. W. monsoon commences at the end of March and lasts to the middle of September.

#### PERSIAN GULF.\*

In the Persian Gulf the winds from N. W. prevail nearly the whole year. Winds from the S. can only be expected in November, December, and January, and then are not durable.

With the exception of these three months, during which there are at times strong squalls from S. S. W. and S. W., southerly winds are very rarely found in the Persian Gulf. When these winds acquire some strength and last two or three days, it is almost certain that the winds will return from N. W. with increased strength.† It even happens, in the months when the winds from S. are most frequent, that the ships which proceed with these winds are suddenly involved in strong squalls from the N. It is observed that the N. W. winds which succeed these gusts from the S. are ordinarily much stronger and last longer than the preceding.‡

---

\* Among authors there is a great difference respecting the prevailing winds in the Persian Gulf. Some give a N. W. monsoon from September to July or from October to May, and a monsoon from the S. E. during the other months of the year. Others say that the N. W. winds are dominant during nearly the whole year. Others again indicate two monsoons, blowing six months each. We have adopted the opinion which appears to be the result of the greatest number of observations

† D'Après de Manneville.

‡ Horsburgh.

The N. winds, which occur once in the year, in June and July, and last forty days, are called the *shemaal*. They are interrupted by some intervals of calm or light breezes. It is useless, at this period, to attempt to go from S. to N. in the Persian Gulf. There is also in March and April a little shemaal, which lasts sometimes twenty days without varying in force or in direction. Four or five days before it commences the currents of the gulf begin to run with rapidity to the N., by which ships in beating can gain about twenty miles per day. Shemaal.

The winds of the gulf are neither as regular nor of as long duration as those of the Red Sea. They are frequently interrupted by the land breezes or by strong winds from the S. W., principally at the entrance of the gulf.

The winds from N. W. and S. E. are the only ones having any considerable duration. Those from any other direction are always light and variable. During the winter months S. winds are accompanied by rain.

The following observations\* particularly refer to the southern part of the Gulf of Persia :

In October the winds are variable ; there are at times fine breezes from the W. and S. with very fine weather. October.

During November the winds vary from N. E. to S. E., and to S. W. At the epoch of the new moon there is generally a strong breeze from the N. E., which lasts three days, with an overcast sky. The weather then becomes fine again. November.

In the month of December the winds are often from N. Most generally they are not strong, except at the time of the new moon ; it then blows a strong breeze from N. E., and the weather is fresh and agreeable. December.

In January the winds are variable from N. E. to W.; they hold generally from the N. and the E., with a good breeze from N. E. at the epoch of the new moon.† Snow is then seen on the mountains. January.

---

\* Lieutenants Guy and Cabaret.

† It has been observed that over the greatest portion of the globe bad weather and gales of wind occur rather about the time of the new than that of the full moon, and that it blows oftener in obscure nights than in those lighted by this planet. From examining its position relative to its apogee and its perigee, when near one of the phases, as below mentioned, the following laws concerning the changes which may occur at this period have been established, principally in the Indian Ocean. When the moon approaches its perigee, a change of weather may be expected. If the new moon coincides with the perigee, the greatest num-

- February.** In February the winds generally vary from N. N. E. to S. W., and sometimes to N. W.; there are occasionally storms and strong land breezes blowing from the coast of Arabia. There is little rain on this coast, though much falls on that of Persia.
- March.** During the month of March strong winds are experienced from the N. and W., particularly at the new moon.
- April.** In April the breezes are moderate, blowing from the W., with rain squalls; at the time of the new moon there are storms. Toward the end of this month there are sometimes winds from the E., which last two or three days.
- May.** During the month of May the winds are from W. to S., with good weather; at the end of this month there is dense haze. The atmosphere is then charged with sand, which from its extreme fineness rises to a great height; this is the case especially in the north of the gulf, and on the shores bordering the desert.
- June and July.** In June and July the great shemaal blows fresh from N. W.
- August and September.** In August and September the winds are variable, with a tendency to the westward. In the Persian Gulf, near the coasts, the land breeze blows every evening, after a very short interval of calm at sunset. The atmosphere is then very heavy; toward midnight the breeze increases, and dies out at sunrise; there is then an interval of calm, and the sea breeze commences toward noon.
- Basra.** At Basra, (or Bassora,) a town situated in the north of the gulf, rains are rare, and there is seldom a S. wind.
- Ormus.** At Ormus, a city at the entrance of the gulf, the wind generally varies as follows: From midnight to sunrise it is from the N. and cold; it then turns to the E. until 10h.

ber of chances are that the weather will change; that is, thirty-three to one. When the new moon coincides with the apogee there are seven chances to one that there will be a change in the weather. The full moon coinciding with the perigee, there are ten chances to one. If with the apogee, eight to one. When the new moon coincides with the perigee, and the sun is on the Equator, the chances of a change of weather are great; when many of these circumstances are combined at the time of the autumnal equinox, a typhoon may be looked for on the south coast of China, and a tempest in other localities within the tropics.

It should be remarked that these changes do not always arrive at the precise time of the circumstances mentioned, and that they often take place two or three days before or after the change of the moon. The latter is at its apogee when its semi-diameter and horizontal parallax are the least, and in its perigee when they are the greatest.

or 11h. in the forenoon. Afternoon it passes to the S., arriving at that point about 3 p. m.; this wind is warm; it turns then to the W. and toward the N. at midnight. The season of intense heat in the Gulf of Persia is from June to August.

In the Arabian Gulf or Gulf of Oman, lying between the coast of Arabia on the west, Scinde, Guzerat, and Concon on the east, and the coast of Persia on the north, the S. W. and N. E. monsoons are found; the first is more constant and has more strength than the latter. The S. W. monsoon commences on the coast of Africa to the north of the Equator in the first part of March; toward the end of this month it prevails on the coast of Arabia, at the entrance of the Red Sea, and as far as Cape Ras-el-Gat; at the beginning of April it is felt on the coast of Persia and outside the Persian Gulf. About the 15th of April, at Cape Gwadel, Guzerat, and as far as Cape St. Jean. At Cape Comorin the S. W. monsoon is not established before the middle of April or the beginning of May. At latest, it extends throughout the gulf by the 15th of June. This monsoon commences and ends sooner near the coast than at large.\*

From November to December, to seaward of Bombay, the winds blow fresh from N. E., and their strength increases in going to the W. During these two months, as also in January and February, they draw considerably to the N., and are accompanied by fine weather.

In January and February the winds are more moderate than during the preceding months; if they go to the N. E. they are interrupted by sudden squalls from S. to W.; which should be distrusted.

During March and April the N. E. winds are less regular than in the preceding months; they are at times interrupted by winds from the N. W. and calms. It may be taken as a general rule that from February to March the breezes are strong; they vary from N. to W. N. W. in this last month and announce the change of the monsoon.\*

To seaward of Bombay and off this port, in March, April, and May, the winds vary from N. W. to S. W., and over an extent of 6° or 7° to the west of the coast of Hindostan they have a strong tendency to the W.

On the coast of Concon, Canara, and Malabar, that is, the west coast of India or of Hindostan, the S. W. monsoon

Arabian Gulf  
or Gulf of Oman.

November and  
December.

January and  
February.

March and  
April.

May, June,  
July, August,  
September, and  
October.

Coasts of Con-  
con, Canara, and  
Malabar, or the

\* D'Après de Mannevillette.



west coast  
Hindostan.

of commences at Cape Comorin between the end of April and the middle of May; it is not felt at Bombay until a month later. The N. E. monsoon succeeds it, and blows near the coast before it is felt at large.\*

On the coast of Hindostan the N. E. monsoon is neither constant in its force or direction. It is established at Bombay and upon the northern part of the coast about the commencement or middle of November. It arrives sooner at Cape Comorin, Cochin, Calicut, and Mangalore, bringing fine weather. The change of the monsoon on this coast is generally marked by squalls and a gale of wind, which commences at the S. E. It holds from this point for several hours, with heavy rain, and after blowing from every point of the compass the wind falls in passing to S. W. These squalls generally take place at the end of October or the commencement of November, and if a gale of this kind is not experienced at the return of the N. E. monsoon it may be expected in December.†

In October, and during a great part of November, the navigation of this coast is difficult, whether going north or south, as the winds are not fixed until the end of November or the beginning of December.

From Novem-  
ber to March.  
N. E. monsoon.

From November to March, when the N. E. monsoon is well established, the weather is remarkably fine on the coast of Hindostan, with moderate and fresh winds, varying from N. E. to S. W.

Alternate  
breezes.

During these four months the land and sea breezes blow along this coast; the former are strong in December and January, and to the southward of Calicut they extend a considerable distance from the coast; sometimes they blow twenty-four hours without interruption: In November, and the first part of December, these breezes are light. From the middle to the end of February the land breeze loses its strength and ceases to be regular. When these alternate breezes are well established, that from the land commences at 6h. or 8h. in the evening, sometimes at 10h., and blows from N. E. to E. S. E.; the sea breeze commences at 11h. in the morning, or at noon, and varies from W. S. W. to W. and N. W. These breezes are moderate, and on their change there is always a short interval of calm.

These winds prevail on the coast from Cape Comorin as far as Surate; they cease in the month of March. During this

\* D'Après de Mannevillette.

† Nicholson.

month and April they are replaced\* by winds varying from N. N. W. to W. N. W., which last until the return of the S. W. monsoon.\*

In March and April the land breeze is very light, and lasts but a short time; it blows from the N. N. E. to N. E. by N. It may be said that during these two months there is not in reality any land breeze on the coast of Hindostan, but rather winds varying from N. N. W. to W. N. W., which commence toward noon and last into the first part of the night; it is then calm in the morning. Sometimes, however, there is a light land breeze, though most generally, from midnight to noon, there are light breezes from the N. E. and N. At the time of the full and change, the winds from the N. W. are very strong, and occasion a heavy sea.†

The weather is unsettled during the month of May; the sky is overcast, with appearance of storms, and there are frequent squalls of rain. The winds blow frequently from S. and S. W., and sometimes very fresh, particularly in the vicinity of Cape Comorin, where the monsoons are established earlier than elsewhere on the coast. When it goes to the N. W., and prevails in this month, the weather is fine. Near the land, in May and June, there are sometimes violent squalls during the night, which form on the high lands at the end of May. At the epoch of the syzygies, or in the first part of June, the S. W. monsoon is almost certain to return.

This return is announced by heavy clouds and, in general, a blow from the S. E., varying to S. S. W., which continues several days. After this blow the monsoon is established, blowing from S. to S. W. on the northern portion of the coast of Hindostan. During this monsoon the winds are variable between W. S. W. and S. W. It commences rather at Cape Comorin than at Bombay, where it arrives fifteen or twenty days later. During this monsoon there are squalls, rain, and a heavy sea. The month of May is one of the worst for navigating this coast. In June and July there is no improvement; the weather is a little better, perhaps, toward the end of this month.‡

\* D'Après de Mannevillette.

† Romme.

‡ Leaving the northern ports, Cape Comorin can be doubled at all seasons; but it is very seldom that a vessel goes from the south coast of Malabar to the north from the end of May to September. (D'Après de Mannevillette.)

- August.** In August the weather is somewhat better, the monsoon less strong than in the preceding months, and there are some intervals of sunshine. The squalls then come from the W. N. W., principally on the south part of the coast, where they are also from N. W., which is the prevailing wind near Cape Comorin at this period.
- September.** In September there is more good weather; the winds from W. and W. N. W. then prevail. This month, however, is not exempt from squalls, though these are generally not so strong, and the weather less cloudy and rainy. With the winds from S. W. to N. W., there is a heavy swell coming from the W. S. W., principally in the interval of calm between the squalls.
- October.** In October the weather, up to the time of the full and change, is much the same as during September; afterward it is unsettled, owing to the change of the monsoon.
- November.** In the last of October and in November, when the S. W. monsoon is light, as has been before stated, the land and sea breezes are felt near the coast.
- The Laccadives.** The Laccadives are within the influence of the monsoons which prevail on the neighboring coast.
- To the east of these islands.** It is observed that between the Bassas, on the southern coast of Ceylon, and these islands, during the S. W. monsoon, the winds are quite steady from this direction, varying from W. S. W. to S. S. W., and seldom passing to the S. These winds are fresh; they increase in force and the squalls are more frequent as the Laccadives are approached. An exception should be made, however, of the latter part of September and the first of November. When near these islands the winds are light, interrupted by squalls with rain.\*
- To the west of these islands.** From the commencement of November to the end of February, the period during which the land and sea breezes are felt the length of the coast of Hindostan, there are in the vicinity of these islands, and from one hundred and eighty to two hundred and forty miles from their west coast, regular winds, which vary from N. to N. E. during the day, and haul to the eastward during the night.
- March and April.** In March and April, winds from N. and N. N. W. are found at the same distance from the coast, which vary two or three points in twenty-four hours, but blow most frequently from N. N. W.
- May.** In May these breezes are variable, and blow sometimes

\* Nicholson.

from the W. at the time of the commencement of the S. W. monsoon. When this monsoon is established, the winds at sea are from S. W. to W., bringing a heavy sea. The weather, however, is better than near the coast; the squalls are not so heavy, and there is less rain.

In September, when the monsoon grows light, near these islands there are calms, and at sea winds from the N. W., which last until the establishment of the N. E. monsoon, which sometimes does not commence until November.\*

September.

In the Maldives, in February, March, and April, and especially during the two latter months, the winds are from N. W., varying to W. N. W. The rainy season commences in April with the S. W. monsoon. The dry season is between October and April, though sometimes there is rain in October. During this season the prevailing winds are from the E., and very regular. Some navigators say that during the N. E. monsoon they are light.†

The Maldives.

In March N. N. E. winds, and currents setting to the S. W., are often experienced when far to the west of the Maldives.

The west coast of the island of Ceylon is similarly situated to that of Malabar, and its east coast to that of Coromandel. It may be considered as a prolongation of these coasts, as the weather, the winds, and seasons are nearly the same as those of the Malabar and Coromandel coasts.‡

Island of Ceylon.

The monsoons succeed each other, each lasting about six months; at the end of October the N. E. takes the place of the S. W. monsoon, the seasons changing at the same time. On the west coast of Ceylon the N. E. monsoon is the fine season, while on the east coast it is accompanied by storms, a heavy sea, and continual rains, with intervals only of overcast, cloudy, or foggy weather. This is also the usual weather at this period between the Bassas Islands and Palmyras, while fine weather exists between Point de Galle and Jaffnapatam, a town in Palk Bay.

It is stated that at the end of December and in January variable winds are found around Ceylon for a distance of forty-five miles.

On the west coast of this island and at Point de Galle, the winds from W. to S. W. blow strong at the end of March or the beginning of April; they last until October. The winds are in general stronger on the northern than on the

West Coast.  
S. W. monsoon.

\* Horsburgh.

† Nicholson.

‡ Romme.

southern part of this coast. The N. E. monsoon succeeds it with good weather.

N. E. monsoon.  
South coast.

On the south coast of this island the winds prevail from W. more or less during the whole year;\* even in the strength of the N. E. monsoon the alternate breezes are regular.

During the morning the land breeze blows from E. to N. E. and toward mid-day the sea breeze comes in from W. to S. W. To the north of the cape of the Bassas the N. E. wind is met, which is generally quite strong on the east coast of Ceylon.

On the south coast, in October and November, there are strong winds from W. varying to N. N. W., and sometimes variable winds. Strong squalls come off the land, accompanied by rain, sometimes calms. Light variable breezes or fresh sea breezes are met with. During the month of December the winds at Point de Galle are established from the N. N. E. to E. N. E. Seaward the winds have a strong tendency to the E., and at this period the monsoon has its greatest strength.

East coast.  
S. W. monsoon.

The S. W. monsoon commences on the east coast of Ceylon in February or March; it does not, however, extend to the northern part of the island before April or May. At the end of March, at Trincomale and the promontory of Palmyras, there are squalls, with rain. There are also squalls from the N. W. toward the end of April, which occur from time to time during the monsoon.

April.

In April the winds are generally variable and moderate along the whole east coast of Ceylon. They blow from E. to S. E. during the day, and come from the S. toward evening. In the beginning of the night the land breezes blow from S. W. to W., that is, the winds are alternative. The S. W. monsoon is established on the northeast coast of the island from the middle to the end of this month, that is, fifteen days earlier than upon the Coromandel coast.

May.

In May the winds are nearly the same as those of April, from the S. E. to S. by day, and S. W. at night.

June, July, August, and September.

In June, July, and August, and even to the middle of September, the winds from the western quarter blow without interruption; sometimes on the northeast coast, in the month of August, there is toward noon a sea breeze varying from E. to S. E.; it ceases in the evening, recommencing with strength during the night.

\* Nicholson.

In Palk Bay in May, June, and July, the S. S. W. winds are very violent. Palk Bay.

At the change of the monsoons, on the east coast of the island, the land and sea breezes blow, as before mentioned.

On the east coast of Ceylon, in September and October, the winds are the same as on the Coromandel coast, which will be spoken of hereafter. N. E. monsoon.

The rains fall on the northern part of the island only in October, November, and December; during the other months there are only fogs and heavy dews. October, November, and December.

On this coast, during the N. E. monsoon, the weather is quite good and the winds are fresh from N. to N. by E.

In December and January there are at times strong winds from this quarter. January.

The N. E. monsoon only extends as far as Point de Galle; at this period the winds are regularly from N. E. in the Gulf of Manar, and often very strong. In this gulf, during the monsoon, it is stated by some navigators that thirty miles to the south of Cape Comorin there is neither fog nor overcast sky, and that the circumstance indicates this as the limit of the region of rains and bad weather. Nicholson says that this is not the case, and that upon the west coast of Ceylon the weather is the same as upon that of Malabar. Gulf of Manar.

The Gulf of Bengal is that portion of the sea between the coast extending from Ceylon and Calcutta on one side, and between the mouth of the Ganges and the Straits of Malacca on the other. Gulf of Bengal.

The Bay of Bengal is the northern part of the gulf. Over this space of sea the winds are very variable, and, from their importance, we will describe them in full. We will make first the general observations before entering into the particulars relating to the coasts forming its west and east boundary. Bay of Bengal.

The S. W. and the N. E. monsoons succeed each other with regularity, after a duration of six months.

The S. W. monsoon commences earlier in the northern than in the southern part of the gulf; it begins near the coast of Orixá at the commencement of March, and fifteen or twenty days later on the coast of Golconda, and does not arrive on the Coromandel coast until the end of this month. On the northeast coast of Ceylon, as before stated, they do not blow until the middle or end of April. At the end of May the S. W. monsoon.

S. W. monsoon blows throughout the gulf and extends to the Equator.

N. E. monsoon. After six months it is replaced by the N. E. monsoon, which is established, in the localities designated, in the same manner—the S. W. monsoon ceasing the earliest in those places where it is the latest established.

Change of monsoon. At the change of the monsoons, in March and October, the winds are variable; in the Bay and Gulf of Bengal, however, they blow more frequently from N. E. than from any other quarter. Violent tempests take place at this season; they are more violent near the coasts of Bengal, Orixá, Golconda, and Coromandel, than upon those of Chittagong, Aracan, Ava, Pegu, Martaban, &c., which form the east coast of the gulf. They are, besides, more formidable and more frequent in October and November than in April, May, or June.

Gales. Gulf of Bengal. October and November. In the part of the Gulf of Bengal between the Coromandel coast and the Andaman Islands, the gales of October and November blow with violence from W. S. W., varying to W. N. W. and N. W.; sometimes they turn to the S. E., but most generally to the N. E. There are those in January which come from the N. E., which are much more moderate.\*

April, May, and June. The gales in April, May, or June commence always from N. N. W. or N. N. E., the wind turns to N. E. and E., and ceases on passing to S. from E.; it is strongest when it blows between N. E. and E. These gales are accompanied by much rain.† Sometimes the wind in going to the S. of E. flies suddenly to S. E. or S., and does not cease until it has blown with violence from the S. W. When the wind takes this course it attains its greatest strength. These gales are, however, rare. Near the coasts the tempests are indicated by a heavy swell, which comes up at least twelve hours before it blows.

In the middle of the Gulf of Bengal and near the east coast there are calms, principally as far as the Straits of Malacca; they are more frequent in February, March, and April.

Bay of Bengal. In the Bay of Bengal, especially in the bight, the monsoons are not very regular; the change takes place in April

\* Romme.

† D'Après de Manneville states that the winds in the tempests of November follow this course, and besides that these tempests rarely occur in the Gulf and Bay of Bengal.

and October. Sometimes the S. W. monsoon changes at the end of September; at others it continues until the beginning of November.

The blows in October and November are stronger than those in May and June. These gales are also stronger on the west than on the east coast of the bay; they are particularly frequent in June. <sup>Tempests in the Bay of Bengal.</sup>

In April, May, and June, the following are the indications of these tempests: \* The S. W. wind falls; there are flaws of wind from all points of the compass, with intervals of calm; round the horizon it is clearer than usual; through the rigging is heard a sighing like that produced by a light wind; the sea is often very smooth, and the "threads of the virgin" may be seen on the rigging.† <sup>April, May, June.</sup>

The most violent tempests come from W. S. W.; they pass to W., W. N. W., and N. W., where they become stationary, and blow with fury.‡ They last ten or twelve hours.

Near the Promontory of Palmyras, though the storms commence generally as we have stated, sometimes the wind turns from N. W. to N., to N. N. E. and N. E.; there is then a calm for a half or a quarter of an hour, which is followed by a wind from S. W. as violent as the preceding wind; this wind falls after an hour's duration, and it recommences blowing from E. S. E., varying to E. and N. E., when it calms again, to blow from the S. W. as before. These storms are much less violent than those which terminate at N. W.; heavy rain accompanies them.

The tempests of October and November are heavier than those of the months just mentioned. They are announced by a light rain and a moderate wind from E. S. E., which increases gradually in turning to the E., to the E. N. E., N. E., and N.; it ceases after blowing from this last direction. Sometimes, in very violent tempests, the wind goes to N. N. W. and N. W., with heavy rain which falls while it lasts. At the same period there are storms from the E. to E. N. E., varying to N., which last one or two days. They are followed by a calm of some minutes, when the wind flies with violence to the S. W., blows a half hour or an hour, and then falls. <sup>October and November.</sup>

The N. E. monsoon should commence, in the Gulf of Bengal, in October; but it is rarely found in the southern part <sup>Delay of the N. E. monsoon in the Gulf of Bengal.</sup>

\* Captain Williams.

† White threads, resembling spiders' web.

‡ Romme.



of the gulf during this month. Between Ceylon and the Straits of Malacca, from the Equator to the parallel of  $8^{\circ}$  or  $10^{\circ}$  N. latitude, there are frequently, in October and November, quite strong winds from the W., which last for several days in succession. In the vicinity of the Equator these winds blow often from the N. N. W. to N. W.; on the line from Ceylon to Acheen Head they vary from W. S. W. to W. N. W.; while in the northern part of the gulf they are from S. W. or S. S. W.

In October and November these winds prevail most frequently in the vicinity of the Nicobar Islands, and over the space between these islands and Ceylon. It is not necessary, then, in going to this island or to the Coromandel coast to make Acheen Head.

We will complete these general observations on the Gulf and Bay of Bengal, by mentioning the winds which have been more particularly observed during certain months.

During the N. E. monsoon, at sea off the coasts of the Gulf of Bengal, the winds vary from N. N. E. to E. N. E. During the S. W. monsoon they are principally from the southern quarter. This monsoon ceases later at sea than on the coasts.\*

S. W. monsoon  
in the middle of  
the Gulf of Ben-  
gal.  
March.

In March the winds are variable from S. W. to S., turning to the E., and even to N. E.; the southerly winds prevail near the coast, while at sea they are from N. E., varying sometimes to S. E., and rarely to S. W.†

April and May.

In April and May the winds in the middle of the gulf are from S. S. W. to S. W.; they haul in May as far as W. S. W. At times in April the winds are light and variable, interrupted by calms, and they are found from N. E. varying to E. and S. E.; from N. E. they are strong.‡

June, July, and  
August.

In June, July, and August, the monsoon is in its full force, and the wind holds constantly between S. W. and W., principally between June and July; at the end of this last month and in August, they pass often to the W. N. W., and even to N. W.

N. E. monsoon.  
September and  
October.

In September and October, sometimes even from the middle of August, the winds are most frequently from the W., varying to S. S. W., accompanied by heavy rains, which do not cease until the beginning of October. After the 15th of September, and during October, the S. W. monsoon

\* D'Après de Mannevillette.

† Nichelson and D'Après de Mannevillette.

‡ Nichelson.

becomes light and the winds are variable, and frequently from N. E. to N. N. W.

In November the winds are generally variable between N. N. E. and E. N. E., as also in December and January, when the monsoon becomes perfectly established in the gulf. In October and November there are storms, as we have said above, which are accompanied by much rain. From the middle of December to the end of January the N. E. wind is more moderate than in the preceding months.

February is the finest month of the year, and the winds are fresh between N. N. E. and N. E. At the end of this month the monsoon becomes light, and the winds from S. are more frequent than those from N. At the end of February, in the southern part of the gulf, they are from S. to S. S. W.

In January, February, and March, the N. E. winds vary often to the S. E., but seldom to the S. W. Following these general remarks on the winds of the Gulf and Bay of Bengal, we will speak of the special winds which have been observed, during each month, on the coasts within its limits; commencing on the west coast, we will make the tour of the gulf.

On the Coromandel coast\* the S. W. monsoon, which is established from the middle of April to the middle of May, is the season of fine weather. The N. E. monsoon, which succeeds it, is the season of storms, rains, and squalls. These storms and squalls, are, however, less frequent and less formidable than on the coast of Malabar.

In March the weather is fine; storms seldom occur, and are of short duration. There are ordinarily twenty-seven days of good weather in this month, during which the winds are moderate and regular in their force, and vary from S. W. to S. E.

In the afternoon the S. E. wind commences, turning at times to the E., and even to the N. E.; it rarely, however, takes this last direction. After midnight the wind comes from N. E., varying to S. W., sometimes followed by calm; but when it is fresh it lasts until 9h. or 10h. in the morning.

In April the N. E. monsoon ends, but the alternate breezes of land and sea often blow in this month. Those from the

\* The following remarks are taken from D'Après de Mannevillette Nicholson, Rommie, and the *Nautical Magazine* of 1838.

sea set in toward noon, and last during a part of the night; they then turn to the S. S. W. and S. W.; when these are strong the breezes from S. S. E. are equally so, and commence often at 9h. or 10h. in the morning. They last sometimes the whole night.

Toward the middle of this month the winds become variable, and the weather unsettled, with rain at times. The winds from S., varying from S. W. to S. E., still prevail, the latter blow sometimes very strong; varying in the evening toward the S. and S. W., they lose their force. There are occasionally calms; these are rare, however, and generally precede a gust of wind, or occur at the return of the N. E. monsoon. In this month, unless a ship sails well, it is almost impossible to go from the north to the south along the Coromandel coast, on account of the strong currents running to the N. E. During the month of April, as a mean, there are twenty-four fine days. Storms are of seldom occurrence, although the weather frequently looks threatening, and lightning is seen in the west. Strong winds, with squalls, occur, however, which last two or three days, accompanied by heavy rain. At this season a vessel should keep on the coast, on soundings of from fifteen to seventeen fathoms,\* for there is a high surf on the coast, and to seaward a heavy swell.

At the end of April the winds from W. commence and last several days; seaward they are light, variable, and interrupted by calms.†

May.

In May, variable winds from E. S. E. to S. W. prevail on the Coromandel coast. The sea breeze sets in at mid-day and blows strong from S. E.; it holds sometimes until midnight, and goes to S. and S. W., the direction from which it blows during the morning. Sometimes one breeze succeeds the other with the same force; at other times, there is an interval of calm between them. From the middle of April to the middle of May storms sometimes occur.

Storms on the  
Coromandel  
Coast.

The storms on the Coromandel coast commence, most frequently, at N. W. and pass to the N. N. E., and E., or to E. by S., and cease when the wind blows from this direction; they are particularly violent when the wind blows from N. E. Sometimes in these storms the wind hauls by the S. as far as S. W., and in this case they are very violent. They are in general preceded by a large wave running to the

\* D'Après de Mannevillette.

† Romme.

land. There are also storms with rain; in these it does not blow hard.\* These storms are not frequent, but when threatened with one, no time should be lost in getting a sufficient offing while the wind blows from N. N. W., and before it turns to the E., the point from which it is most violent. There are in this month about nineteen days of good weather, with a clear sky; during the evening it is often cloudy in the west. When the wind is fresh during the day, the weather becomes foggy, and the horizon obscure.†

In June, July, and August, the S. W. monsoon is in full force, the wind varying from W. S. W. to W. If it is moderate, the sea breeze, which is very weak and uncertain, is felt, varying from S. E. to S.; it is from this last direction in the evening. It commences at 1h. p. m. and ends at 9h. or 10h. in the evening, and even at midnight. In the morning the wind flies to S. W., sometimes to W., and becomes a stiff breeze. The winds from W. and S. W., according to D'Après, are, at times during these months, warm, and even so burning as to be almost insupportable. They blow with so much violence that they fill the air with dust and sand. These clouds of dust are sometimes carried far to seaward, especially when the season is dry. In August the rains and gusts are frequent, and usually prevent the wind from having this effect. While on the Coromandel coast, this season is sufficiently good; there are abundant rains in the Bay of Bengal, as on all the east coast of the gulf; at Balassore even the winds from W. S. W. are strong and very disagreeable.

June, July, and August.

In the month of August the S. W. wind commences to be less regular than during the preceding months; the land and sea breezes are more established; the last blow from S. E., and in the evening go to the S. and S. W. During this month there are squalls from the S. W., rain, and gusts of wind; towards the end of this month the winds are variable from W. N. W. to N. W.‡

Occasionally, winds have been observed in August from N. E. blowing very strong for one or two hours, with rain; they then haul to the E. S. E. and S., blowing with force,

\* D'Après de Mannevillette. He adds, that in the Bay of Bengal the months of April and May are dangerous, owing to the storms which occur in certain years. Seldom one passes when there are not gusts from the N., and violent winds during five or six hours, sometimes more, and these succeed each other every third day at most.

† *Nautical Magazine*.

‡ D'Après de Mannevillette.

and return to the E. in squalls accompanied by rain. When these winds go to the S. W. the weather becomes fine.\*

In June there are eight days of fine weather, eleven days cloudy, and the same number overcast.

In July there are only eight clear days; the others are generally overcast or foggy.

In the month of August there is much lightning without thunder, as in the preceding month there are but eight days of clear weather.

**September.**

During September the winds are variable and the weather uncertain; there are at times squalls accompanied by heavy rain. The westerly winds, however, predominate; they vary often from W. S. W. to W., and haul as far as N. E. In the day there are breezes from the N. E., but more frequently from S. E. to S. S. E. In this month the wind is generally very moderate, whatever may be its direction, and though there may be some sharp squalls in the latter part of the month, when they come from the land, they are of short duration.†

The sea breezes come in towards 2h. or 3h. in the afternoon and last until 8h. or 10h. in the evening. There is much lightning, especially in the evening, but it seldom thunders. The remarks upon the weather for the month of August are in a great measure applicable to the month of September.

**N. E. monsoon.**

The N. E. monsoon generally commences between the middle of October and the first of November. In the month of October the clouds are more dense than during the preceding months; calms, lightning, and rain are frequent until about the 9th of this month;‡ the winds are very variable, and squalls frequently occur.§

Sometimes in the morning the wind comes from the E.; at others it blows very fresh from N. N. W. during several days; it then brings squalls and rain. In the afternoon it turns to N. E., varying to E. N. E.; in this case the weather becomes rainy.

Violent storms are rarely experienced, although the appearance of the weather may be threatening. It is prudent, however, not to remain on this coast beyond the 15th or 20th of October.\*

Towards the end of the month the weather is bad, subject to squalls, with heavy rains, thunder, and lightning.

\* Nicholson.

† D'Après de Mannevillette.

‡ *Nautical Magazine* and D'Après de Mannevillette.

In November the winds generally blow in the morning from N. E. to N. N. E., varying from N. N. W. to N. W.; in the afternoon they return to N. N. E. and N. E. Some days, though very rarely, they turn to S. E. or S. W. Calms sometimes last for several days, and after these calms there are often storms with heavy rain. The N. E. monsoon may commence by a violent gust from N. W., which passes to the N. and N. E., and ends at E. Sometimes it commences at N. E. In the middle of the Gulf of Bengal it blows from the S. W. and W. From the beginning of October to December there is a liability to these storms. When the wind in these storms goes to the S. of E., it moderates, and the weather clears. If, on the contrary, after blowing strong from the N. E., there is a calm, it turns to the S. E., S., and S. W., and blows hard. During the month of November the weather is almost always somber and overcast.\*

November

In December the N. E. monsoon is well established, and the rains are less heavy. In the morning the wind comes from the N. N. W. to N. W., and passes in the afternoon to the N. N. E., varying to E. N. E. At N. E. the wind is fresh, and at times blows for several days in succession.†

December.

The weather is better and more settled than in the preceding months, and thirteen fine days may be counted on in December.‡

During the months of January and February the weather is quite good, the sky clear, and the sea smooth; the squalls from the N. E. are rare and of short duration. During the day the winds are usually from E. N. E. to N. E., and in the night they vary from N. N. W. to N. W.

January and  
February.

In February the N. E. monsoon loses its strength, though it continues to the middle of this month, when there are calms, and often winds from the S. E.§ At sea the monsoon lasts longer than upon the coast. There are years when the winds from N. blow until the commencement and even to the end of March.||

It is observed that, near the Coromandel coast, the winds from the southward prevail, when over the Gulf of Bengal || the N. E. winds are established. The opposite also takes place. In the month of January the weather is very mild; as a mean, there are twenty days perfectly clear. The month

\* D'Après de Mannevillette. † Dampier and D'Après de Mannevillette.

‡ *Nautical Magazine*.

§ Forest and D'Après de Mannevillette.

|| Nicholson and D'Après de Mannevillette.

of February is regarded as the finest of the year. In this month there is very seldom rain or lightning.\*

Coasts of Golconda and Orixá.

On the coast of Golconda the S. W. monsoon, which brings fine weather, is established at Point Divy, near Masulipatam, about the 15th or 20th of March. It prevails on the coast of Orixá toward the beginning of March; that is, this monsoon commences in the bight of the gulf earlier than in its southern part. The N. E. monsoon succeeds it after an interval of six months, and commences at the corresponding periods; this is the bad season, especially in November and December.

S. W. monsoon. February and March.

On the coasts of Golconda and Orixá, at the end of February, the winds are from N. E., sometimes fresh, but oftener light. The land and sea breezes are generally established in the first part of March; the land breeze varies from W. N. W. to S. W.†

In March the wind is from S. E., varying to E. S. E. during the day; from S. S. W. to S. W. during the night. There are at times strong winds from N. W. on these coasts, and also at Balasore, to the west of the mouth of the Ganges; they are particularly frequent at the end of March.‡

April and May.

In April and May the winds from the southern quarter are often strong, particularly on the coast of Orixá. They vary from S. to S. E., bringing hazy and foggy weather. In May they vary from S. S. E. to S. W., and sometimes to W. S. W. On the coast of Orixá and at Balasore,§ in the month of May, it sometimes blows fresh, and often from S. S. W. to S. W. The weather is overcast and is very bad at this season of the year, as then, but more especially in June, violent storms occur. From the end of May to the end of June it is dangerous to go to Balasore, as also between the end of September and the end of October; that is, at the time of the change of the monsoons.

June, July, and August.

In June, July, and August there are frequent squalls, with rain; during these months the S. W. monsoon is in full force on the coast of Orixá, and the sky is overcast.

Balasore.

At Balasore the winds blow with much force. During the S. W. monsoon it is from the westward. In April and May it blows often from S. to S. E.; if it passes from the S. S. E. to S. W., blowing fresh, it brings rain, while the weather is fine on the coast to the southward. In June, as also in July, the winds are variable from S. to S. E.; in August the weather

\* *Nautical Magazine.* † Romme. ‡ Nichelson. § Ranson.

is unsettled, with winds from S. S. W. varying to W. N. W., and sometimes from S. S. E., when there are heavy rains and squalls near Balasore.

About the 21st of September on these coasts the winds are strong from E. and there are usually storms at the end of the S. W. monsoon. N. E. monsoon.  
September.

The N. E. monsoon is felt in October and November, though in the first month the winds from N. E. are variable. October, No-  
vember, and De-  
cember. November and December are the two months of bad weather in which blows may be expected.

About the middle of January the N. E. winds are more moderate and the rains cease at the end of this month; the land and sea breezes then set in, the one from W. N. W., the other from E. N. E. January.

The Bay of Bengal is, as before stated, the space at the bottom of the Gulf of Bengal, which is bounded on the west by the coast of Orissa, on the north by Bengal, and on the east by the coasts of Chittagong, Aracan, Ava, and Pegu. Bay of Bengal.

The S. W. monsoon is established in this bay in the first part of March; the N. E. monsoon six months afterward. During the former the winds blow generally from the S., bringing heavy rains. During the latter they vary from N. N. E. to E. N. E., and, according to some, from N. E. to N. N. W.

Besides the gusts of wind already mentioned, which are met with near these coasts in the months of April and August, when the S. W. monsoon is at its strength, there are others of less duration which occur at different periods of the year, principally near the coast of Bengal; the squalls in the S. W. monsoon come sometimes from S. S. E., but oftener from S. to S. W., turning to the W. There are also, in September, October, and November, and even in the beginning of December, squalls from the southward; it is rare, however, that they occur in December.\*

In March and October, the period of the change of the monsoon, the winds are variable, but blow more from the N. E. than from any other direction. This is the season of storms and bad weather. March and Oc-  
tober.

When the monsoon gets light, the land and sea breezes are regular; those at the end of the S. W. monsoon are not as fresh or as regular as those at the end of the N. E. monsoon.†

\* D'Après de Mannevillette.

† Romme.



At the entrance of the river Hoogly the changes of the monsoon are often indicated by N. W. winds blowing in squalls; these winds are preceded by heavy clouds, which rise rapidly and are sometimes accompanied by lightning; at times they are very violent.

S. W. monsoon.  
March, April, and  
May.

Towards the end of March or in the beginning of April the wind from S. W. becomes fresh and regular, varying from S. S. W. to W. S. W. The weather is then overcast and rainy; squalls and rains seldom occur, however, after the 15th of May. Sometimes in the month of March the winds vary from S. W. to S. E., and even to N. E.\*

The months of April and May are, according to some navigators, the most dangerous for navigation in the Bay of Bengal. During the latter month there are storms from the northward.\* It is generally conceded that the worst months for the navigation of the bay are those of June and July.

June, July, and  
August.

From April to June the winds are generally variable from S. to S. E.; in June, July, and August from S. W. to W., and sometimes in the latter month from W. N. W. to N. W. In the month of August, though storms may occur, there are many days of fine weather.

N. E. monsoon.  
September.

In September the S. W. monsoon fails, the winds are moderate from N. W., and rain continues to fall in abundance; the winds during this month are quite variable; sometimes the weather is fine, at others rainy with squalls. After the 15th of September, in traversing the Bay of Bengal for the east coasts, to seaward of Balasore, the winds are sometimes found variable from the N. E. to N. N. W. Near the time of the equinox the winds are strong from E. in the vicinity of Balasore, and after this period, in the middle of the bay, winds are found from N. W. Before the change of the monsoon there is sometimes a short but violent gale, which is felt the whole extent of the bay.

October.

In October the rains cease on the coasts of Bengal, Chittagong, Aracan, Ava, and Pegu. At the commencement of this month there are still winds from the S., interrupted by variable breezes and by strong winds from N. E. to E. It can be said that in this month the winds are variable from N. E. to S. W.

November, December, January,  
and February.

In November there are strong winds from N. E. After this month, and sometimes even from the month of October to March, the prevailing winds are from N. N. E. to N. E. †

\* D'Après de Mannevillette.

† Captain Hicks.

In December and January the winds are nearly the same as in November.

During February, the finest month of the year, on the east coasts the winds are nearly certain to be between N. and E., while on the west coasts the regular land and sea breezes are found, or rather winds, sufficiently fresh, varying from W. N. W. to S. W. The land breezes are not regular for any distance off shore.

Finally, the N. E. monsoon commences in the first part of October, on the coasts which form the bight of the Bay of Bengal, and is felt later in the middle and southern part of the bay, as also between the islands of Nicobar and Ceylon. In these last localities, winds from the S. W. to W. often prevail through October, and, sometimes, only end in November.

To the north of the parallels of  $17^{\circ}$  or  $18^{\circ}$  the winds are often weak during the N. E. monsoon; sometimes they blow from this point, though more generally they vary from N. N. E. to N. N. W. In the Bay of Bengal there is much calm weather and light breezes during the N. E. monsoon, particularly on soundings on the north coast and along the coasts of Aracan and Ava, though at times there are strong breezes from the S. It can be said, however, that, in this monsoon, the prevailing winds during the day are from N. W. to W. N. W., and during the night from N.; it is seldom that they vary to the N. E.

On the coasts of Martaban and Tanasserim the S. W. monsoon commences between the middle and end of May; and after six months is succeeded by the N. E. monsoon, during which the winds are often found from the N., near the Andaman and Nicobar islands, while to seaward they blow from N. E. by E., varying to E. N. E. The S. W. monsoon is not regular at seventy-five or ninety miles to the eastward of the Nicobar Islands; in this zone the winds are variable from W. to N.; sometimes from S. E. to S. W., turning by the S.; they are most frequently, however, from the N. W., accompanied by squalls and heavy rains; sometimes, again, the winds are very light and variable and interrupted by calms.\* The sea is smooth and the sky clouded.

In the vicinity of the Nicobar Islands, at the period of the change of the monsoons, there occur tornadoes which

\* Nicholson.

rarely last more than an hour. The N. E. monsoon commences in November, with the fine season. The winds, in the neighborhood of the Nicobar Islands, are light during this monsoon, and often interrupted by land and sea breezes. Ordinarily, near these islands, during this monsoon, the winds are from N., while in the offing they are variable from N. E. to E. N. E. The N. winds prevail to the north of these islands during December and January; sometimes at the end of April there are gusts of wind from the W. The S. W. monsoon commences, as we have said, in May; the winds then, near the Nicobar and Andaman islands, blow strong from S.

In the islands, near the coast of Tanasserim, the winds are light in July and August, and hang to the N. and W. The strong winds which, during this season, prevail in the Bay of Bengal, lose the great part of their force before reaching these islands.

On the coast to the east of Cape Negrais, in the Gulf of Martaban, the same facts are observed. Calms are found on this coast, principally from February to April; they are seldom of long duration.

N. E. monsoon.  
November, December, and January.

On the coast of Martaban and Tanasserim, from November to January, the N. E. monsoon is regular. In October and November there are gusts of wind which commence at E. S. E., and pass to E., E. N. E., and N., where they cease; they are accompanied by heavy rains.

February, March, and April.

At the middle of February, and in March and April, when the N. E. monsoon becomes light, the land and sea breezes commence on these coasts; they are moderate, blowing from E. to N. W., especially in February. On the coast of Tanasserim, however, the winds are more frequently from S. than N. During these three months there are frequent calms, but of short duration.

S. W. monsoon.  
May, June, July, August, and September.

The S. W. monsoon, on the coast of Martaban and Tanasserim, is strong, and, at times, even violent. The winds vary little during May, June, and July; their direction is W. to W. S. W. The monsoon is in full force from August to the middle of September; then it decreases, and the winds become variable, with calms and cat's-paws.

October.

At the commencement of October, which is the month in which the S. W. monsoon ends, the land and sea breezes reappear on the coasts, which is almost universally the case

throughout India in the interval between the monsoons; they are less fresh than at the end of the N. E. monsoon.\*

Although the Malacca Strait is situated in the zone of the N. E. and S. W. monsoons, the winds in it are very variable. Straits of Malacca. The land and sea breezes are quite regular on the west coast of the Peninsula of Malacca or Malay, and on the northeast coast of Sumatra.

In the strait the winds are not constant; even when the monsoon is at its greatest strength in the surrounding seas, it is but moderate in the strait, and only prevails during the greater part of the day.

The N. E. monsoon, the period of the fine season, lasts from November to May; that from S. W. begins at the end of April or in the first part of May, and generally ceases in October. In November, however, there are often winds from the W.; during this monsoon the weather is generally overcast with rain and squalls, especially when the monsoon is strong.

In October and November the winds often vary from N. W. to W. It happens, however, that they blow steadily from N. E. in November; they are then quite strong until March, especially during December and January. Sometimes they vary to N. and even to N. W., and in all the months of the N. E. monsoon there are breezes from W., lasting one or two days. During the N. E. monsoon, the winds, as a rule, vary between N. N. E. and E. N. E. N. E. monsoon. October, November, December, and January.

Towards the end of February, in March, and sometimes only in the first days of April, the N. E. winds turn to the N., and become light and variable; the alternate breezes are then found, interrupted by calms during the day, while at night and at sunrise they are fresh. The coast of the Peninsula of Malay is, during this monsoon, much less subject to calms than that of Sumatra. February, March, and April.

The S. W. monsoon has its full force in June and July. During the four months from May to September, the winds in the strait blow principally from S. W. to S.;† that is at the period when at sea the S. W. monsoon is at its maximum force. During this monsoon, there are calms on the northeast coast of Sumatra, but less than on the Peninsula of Malay, and they are seldom of long duration. In general, it is calm in the middle of the day, with fresh breezes during the night or at sunrise. S. W. monsoon. May, June, July, August, and September.

\* Romme.

† Pedro de Nova.

The monsoon is not generally found fresh except in the northern part of the strait.

**The Sumatras.** During the S. W. monsoon, in the vicinity of Mount Parcelar and Cape Rechado, the winds keep to the S. E. and S. S. E., and in the middle of the night the winds called *sumatras* blow from the S. W. to S., coming from the coast of this island. These winds are strong, coming from the high mountains, and are accompanied by rain and thunder; they commence sometimes with great violence, and last generally from midnight until 2h. or 3h. in the morning. Though they occur throughout the strait, they are principally found near the coast of Pedir, and between the mountain of Parcelar and the Carimon Islands. In this locality they commence by a sharp squall, and last six or eight hours, blowing very unequally—alternately strong and moderate. In the Road of Malacca, where these squalls almost always take place between 7 p. m. and midnight, they should be looked out for.

**Squalls from N. W.** Squalls from the N. W. do not occur as often as the *sumatras*; they are, however, common in the north part of the strait, and are met sometimes in the vicinity of the Carimon Islands, and in Singapore Strait they come up with a sudden and violent gust, but quickly lose their force. They are preceded by a heavy, black, arched cloud, which rises rapidly, giving, generally, but little time to reduce sail; as the *sumatras* they are accompanied by wind and rain. In going to the southward, if at anchor to await the turn of the tide, as soon as one of these N. W. squalls is indicated, a vessel should get under way and make sail before the squall, to profit by it while it lasts, for should she await the squall at anchor, in addition to the difficulty of making sail in the squall, a favorable opportunity of running through the strait would be lost.

**West coast of Sumatra.** On the west coast of Sumatra, which is divided into two nearly equal parts by the Equator, different monsoons are found at the same period, according as the locality is N. or S. of this great circle.

Thus, while the N. E. monsoon prevails from October to April, on that part of the coast situated to the north of the line, the N. W. monsoon, which in the southern hemisphere blows also from October to April, is found on that part of the west coast to south of the line; and while the S. W. monsoon (from April to October) is established on the north-

west coast of the island, the S. E. monsoon, which is only an extension of the trade-winds of the southern hemisphere, prevails on its southwest coast. This last monsoon, from this cause, is always exempt from storms, which is not the case during the N. W. monsoon. During the latter, which is generally stronger than the S. E. monsoon, there are very strong winds, with rain, while, from May to September, the weather is always fine on the southwest coast of Sumatra.

On the west coast of Sumatra to the northward of the Equator, the S. W. monsoon arrives without hindrance. The winds are strong from April to November; toward the end of August they turn to the southward until the middle of September, varying from S. to S. S. W. near the coast, while to seaward they blow from W. S. W. to S. W. Near Pulo-Way they are from S. S. W. to S., principally after the 15th. of September. During the S. W. monsoon the weather is uncertain to the north of Sumatra.

West coast of  
Sumatra to north  
of the Equator.

What has been said regarding the winds applies particularly to Acheen; for when the S. W. winds, which blow in the Gulf of Bengal, arrive on the northwest coast of Sumatra, they appear to be arrested and bent back by the high lands of this island, and take a course along the coast in a N. W. and S. E. direction. They bring rain and bad weather; they are not well established until the S. W. monsoon is in full force, in June, July, and August. At Acheen the season of rains is that of the greatest heat; it commences at the end of April and ends in August.

The N. E. monsoon, which, upon the northwest coast replaces the S. W. monsoon, brings the fine season. The winds are weaker than during the preceding monsoon. The N. E. monsoon, which is very fresh on the east coast of the island, is arrested by the high lands, and is only felt at a considerable distance to seaward of the northwest coast of Sumatra, in the northern part, from ninety to one hundred and twenty miles, and from one hundred and eighty to two hundred and forty miles on drawing nearer to the Equator. Sometimes even the S. E. winds are felt.\* During the months of December and January the land and sea breezes extend along the coast as far as the Equator, and even to Bencoolen. The N. E. monsoon is sometimes, though seldom, interrupted by fresh winds from the N. W.†

N. E. monsoon.  
Fine season.

\* Forest.

† Marsden.

West coast of  
Sumatra to the  
south of the  
Equator.

On the southwest coast of Sumatra, during the S. E. monsoon, the winds vary from S. S. E. to S. S. W. Sometimes, during May, June, and July, these winds are interrupted by the return of the N. W. wind, which lasts several days, particularly at the period of the full and change. This is also the case in the Straits of Sunda and Java.

During this monsoon, in the vicinity of the Equator, the winds are variable, which is the case during the whole year; calms are also found in these localities, but gusts of wind are of seldom occurrence, especially near Pulo-Mintao and Priaman. In this last locality there are frequent squalls from the mountains during the night.

N. W. monsoon.  
Bad season.

The N. W. monsoon, on this coast, commences in November and a little later, as the locality is nearer to or further from the Equator; it ends in March. From October to April the winds are fresh, varying from N. W. to W. N. W., and extend as far as the Straits of Sunda; they are sometimes interrupted by winds from S. and S. E., and by gusts of wind accompanied by rain.

In April, May, October, and November, the months in which the monsoons change, the winds are very variable. Toward the end of each monsoon, the land and sea breezes blow, and it is observed that most frequently the land breezes do not blow from a direction opposite to that of the sea breeze. On that portion of the coast which trends north and south the sea breeze is from N. W.; the land breeze comes from N. E. If the coast trends northwest and southeast, the sea breeze is from S., and the land breeze from E. When the breeze passes from E. to N., on the next day the sea breeze may be expected from W. to N. W.

The land breeze is not felt more than nine to twelve miles in the offing. It commences first near the shore, while from four to eight miles out it is calm. It extends then, little by little, to a greater or less distance, according to the local heat. In an hour the land breeze attains its greatest distance from the coast.\* In general, at the period of the change of the monsoon, the sea breeze is regularly followed by the land breeze. At the end of the monsoon they are neither as fresh nor as regular.

Straits and  
Islands of Sunda.

In the Strait of Sunda the winds are variable from S. S. E. to E. S. E., from April to October. This is called the E. monsoon. During the W. monsoon, which succeeds

\* Marsden.

it, the winds are, generally, from W. N. W. to N. W.; this monsoon is established in November, and brings bad weather. In the strait the alternate breezes blow from S. before noon, and from N. afternoon, and are separated by an interval of calm.

In the Islands of Sunda, as far as Timor, the monsoons are those already mentioned. The E. monsoon commences in May and varies from E. to S. S. E. It is at its greatest strength in June and July. It is fresher than the W. monsoon, which brings bad weather, particularly in November and December. The rains commence in this month, when storms and gusts occur.

The W. monsoon commences in November, and is in full force in January, accompanied by squalls and storms; then the monsoon fails gradually until March. In April the winds become variable and the weather quite good.

On the south coast of Java the wind blows from N. W., when the N. E. monsoon is established to the north of this line, (from October to March;) this monsoon ceases in March. In April the winds are variable; in May they are constant at E., with fine weather, and they attain their greatest strength from June to August; in October, the S. E. monsoon grows light, and, until the return of the N. W. monsoon, the winds are variable.

In May and November the rains on this coast are very abundant.

In February, and during the first fifteen days in March, as also in October, the period of the change of the monsoons, there are regular alternate breezes; they are not so fresh in October as in February and March.

In the two last months, and even in April, the land breeze commences with a squall of rain or wind, which is sometimes quite strong. As soon as this squall has passed, the land breeze blows moderate, until the return of the sea breeze.\* In April and May, on this coast, the sea breeze also commences with a squall of rain or wind of short duration. We mention these facts which appear to be isolated, except in the Island of Santo Domingo, where the same phenomena are reproduced in the road of Port au Prince, and in the Gonave Channel.

On the northwest coast of Timor, from September to March, the N. W. monsoon, varying to N. N. W., is established.

\* D'Après de Mannevillette.



lished. In April, or in May, it is replaced by the S. E. monsoon, varying to S. S. E., which finishes in October. The N. W. monsoon is the season of bad weather, and in December the winds blow with violence. The N. W. monsoon is not well established until the end of November or in December, and the winds vary from W. to N., and blow strong, accompanied by heavy rains, which last until February.

At the end of April, or the beginning of May, the winds return to the eastward, varying to the S.; they are very strong on the northern coast of the island, where it is then fine weather. The strongest winds vary from W. by S. to N. N. E. On the opposite coasts of this island there is a great difference in the winds. The S. E. monsoon is very weak on the south, and very strong on the north coast. On the south coast storms occur in the first days of October, whereas, on the north coast they are not experienced until December. On both coasts, during the fine season, the land and sea breezes blow strong. On the south coast the land breeze varies from N. E. to N.; the sea breeze from S. S. E. to S. S. W.

From the  
Islands of Sunda  
to the coast of  
New Holland.

In the sea, between the Islands of Sunda and New Holland, calms are very frequent. Two monsoons are distinguished: that from W., during which the winds vary from S. W. to N. W., commences in October and ends in April. During this monsoon, which blows strong from December to February, there are frequent rain squalls. The E. monsoon, variable to S. E., an extension of the trade-winds, succeeds it and brings the fine season. The zone where these monsoons prevail does not pass to south of the parallel of Christmas Island; but to the east of this island, its southern limit descends gradually as far as the parallel of  $14^{\circ}$ , sometimes even farther to the southward, and generally it varies between  $14^{\circ}$  and  $15^{\circ}$ . To the east it reaches the northeast part of the coast of New Holland.

Northwest  
coast of New  
Holland.

On the northwest coast of New Holland; from Melville Island to the Northwest Cape, the land and sea breezes blow; the first from the W., varying to N. W., the latter from S. S. W. to S. S. E. These breezes occur principally in the summer of this hemisphere; in the other months they are variable and irregular; they do not extend far from the land. To seaward from the northwest and west coasts the general winds are found.\*

---

\* D'Entre-Casteaux.

Near the west coast of New Holland, situated to the north of the tropic, as on the former, the alternate land and sea breezes are found. There are, however, too few observations of either on which to base any general rule. West coast.

On this coast, from the tropic as far as Cape Leeuwin, the prevailing winds are from N. W. to S. W.\* The climate is warm and rainy and snow is never seen, but large hail falls occasionally. The most violent winds are from N. W., and afterward those from S. W.; the first are particularly violent in the vicinity of Cape Leeuwin. The warm winds which blow from the N. are very oppressive, but are generally of short duration.†

During the summer months the land and sea breezes are regular; the former commences at night and ends in the morning, varying from E. to N. E.; the latter rises after noon, from the W. or S. W., and ceases after sunset.

The following table, drawn up at Perth, in latitude  $31^{\circ} 57' N.$ , longitude  $115^{\circ} 52' E.$ , in 1832, will give a general idea of the climate of this coast, as yet little known. It was communicated by James McGrigor, and is taken from the History of the British Colonies.†

---

\* Forest, Romme, Dampier.

† Montgomery Martin, *History of the British Colonies*, vol. iv.. p. 477.

| Months.       | Thermometer.<br>Fahr. |       |          | Barometer. |       |          | Winds.                 | Observations on the weather.                     |
|---------------|-----------------------|-------|----------|------------|-------|----------|------------------------|--------------------------------------------------|
|               | Maximum.              | Mean. | Minimum. | Maximum.   | Mean. | Minimum. |                        |                                                  |
| January ...   | 99                    | 80    | 61       | 30.1       | 29.9  | 29.8     | N. E., S. W. ....      | First part, fine; middle, cloudy; latter, clear. |
| February ..   | 106                   | 83    | 59       | 30.1       | 30.0  | 29.8     | N. E., S. W. ....      | 8 days cloudy; 3 days rain; remainder pleasant.  |
| March .....   | 95                    | 79    | 63       | 30.2       | 29.9  | 29.6     | N. E., S. W. by S.     | Generally pleasant; rain 4th and 5th.            |
| April .....   | 92                    | 72    | 63       | 30.3       | 30.1  | 29.9     | N. E., N. W., S. W.    | Like April in Europe.                            |
| May .....     | 74                    | 63    | 46       | 30.5       | 30.1  | 29.5     | E. N. E., N. W., S. W. | Rainy 17 days, winds N. W.                       |
| June .....    | 74                    | 59    | 45       | 30.6       | 30.2  | 29.8     | W. S. W., N. W. ..     | Frost 16 days; ice 3 days; heavy storm, hail.    |
| July .....    | 70                    | 56    | 41       | 30.3       | 30.0  | 29.6     | N. E., N. W., S. W.    | Generally fine; ice 1st and 9th; storm.          |
| August .....  | 79                    | 63    | 45       | 30.3       | 30.0  | 29.7     | N. E., S. W. ....      | Rain 10 days; damp; storm 11th.                  |
| September ..  | 76                    | 63    | 50       | 30.3       | 30.0  | 29.7     | N. W., S. W. ....      | Cloudy, squalls, & rain; storm 18th.             |
| October ..... | 76                    | 63    | 50       | 30.2       | 29.9  | 29.5     | N. E., N. W., S. W.    | Alternate good & bad weather; squally.           |
| November ..   | 86                    | 70    | 52       | 30.4       | 30.1  | 29.8     | S. W. ....             | Gale 1st; squally 9th and 10th.                  |
| December ..   | 101                   | 81    | 61       | 30.1       | 29.9  | 29.7     | S. W., N. W. ....      | Cloudy; clear; rain; middle, fine.               |

South coast of  
New Holland.

In the vicinity of Cape Leeuwin the prevailing winds are from the W. During the summer they vary to the N. W. in the night, and to the S. W. in the afternoon; these variations, however, are not regular, and do not occur in winter.

On the south coast, between the Recherche Archipelago, and Bass Strait, the prevailing winds, from the middle of January to the middle of April, are from S. E. to E. N. E. During the night they blow from the land, and in the day from seaward. They are rarely strong, while, on the contrary, the accidental breezes, which blow from the western quarter at this season, are very fresh, and at times violent. These last turn always to the S. W.

Gusts from  
S. W.

Off the south coast of New Holland, it may be said in a general manner that, during the six or eight months of winter, the winds are from the S., varying to W. S. W. During this season squalls from the S. W. are very frequent.

The wind rises at the N. W., accompanied by rain or fog. As the wind increases it hauls gradually to the W., and as soon as there is a little southing in it the weather commences to clear; it then hauls to the S. W., blowing with its greatest violence. The barometer, which at the beginning of the gust falls to 27 inches, commences to rise, and as soon as the wind passes to the S. and S. S. E. it moderates, the weather then becomes pleasant, and the barometer rises to 28 inches. It sometimes happens that the wind goes to W., and even to N., as the barometer falls; then, though the force of the wind may be less, it should not be looked upon as terminated. It does not, however, often return until after an interval of one or two days.

Sometimes the wind flies suddenly from the N. W. to the S. W., when the rain and fog are of longer duration. Such is the general course of the squalls near the south coast of New Holland, as also in Bass Strait, while to the east of this strait and on the east coast of Van Diemen's Land they blow generally from S. to S. E., also accompanied by rain and fog. Near the south coast of New Holland, the barometer rises with southerly winds, and falls with those from the N. to S. by the W. East and west of this continent it rises almost always with moderate breezes from seaward, and falls when they blow from the land.

The N. winds do not prevail near the coast; they are found between the parallels of 40° and 44° S. latitude. To the west of Van Diemen's Land, there are often strong breezes from N. N. E., which sometimes fly suddenly to N. W. and W. These winds are found between the same parallels over the whole space between the bank of Agulhas and Van Diemen's Land; their variations are often whimsical.

In Bass Strait the gusts of wind and strong breezes come from the S. W., and are dominant during nine months of the year. In January, February, and March there are sometimes winds from the E., accompanied by very fine weather. The winds in this locality cannot be calculated on at any season of the year.

The strongest breezes generally vary between S. E. and S. W., and coming most frequently from the first direction, it is dangerous to approach the coast between Cape Howe and Wilson Promontory. On the coast east of the strait,

as also on the east coast of Van Diemen's Land, the winds are sometimes from N. to N. E., but rarely strong.

We have pointed out successively the most general winds found near the coasts which bound the basin of the Indian Ocean. We will finish what relates to this sea by mentioning the winds of the Islands of Mauritius, Réunion, and Rodriguez, which we have thus far left out, in order to speak at the same time of the hurricanes which so frequently ravage them.

Islands of  
Mauritius, Ré-  
union, and Rod-  
riguez.

These three islands are situated in the zone of the S. E. trade-winds, varying from E. N. E. to the S. E., which generally bring fine weather, though there is sometimes rain. At Mauritius the months of November and December are the warmest of the year and those of the heavy rains. At Port Louis, in Mauritius, the following observations on the winds were collected in 1831: In January and February the prevailing winds were from S. E. to N. W.; in March, N. W. and S. E.; in April, N. E. and S. W.; and the same in May; in June, July, and August, S. E., and constant; in September, S. E. and N. W.; in October, S. E., and strong; in November the winds are often variable; in December they blow from E. to S. E.

At Réunion the months from November to April are the warmest, and the season of rains. Around the coast of this island the land and sea breezes blow. Often, at the period of the syzygies, there are winds from S., variable to W.

During the fine season, from April to December, the winds from S. E. are regular, and do not vary, excepting from E. S. E. to S. S. E. The wind freshens generally about 9h. in the morning, and decreases in force after 4h. in the afternoon. During the night it is generally calm; should it be otherwise, there is almost a certainty of a strong breeze the following day. During the day, if the breeze is moderate and ceases early, there is during the night a land breeze.

In June, July, and August the winds are generally very fresh.

The general S. E. winds blow during the winter, from December to April. At this season, however, they are more moderate, and often interrupted by calms and winds from the W. and N. W.\*

---

\* M. G. Cloué, *ensign*, *Mélanges Hydrographiques*, vol. iii.

At the Island of Rodriguez the winds are constantly from E. to S. E., and quite fresh. There are at times squalls and rains, but in general these winds are accompanied by good weather, cloudy or overcast. Calms in the vicinity of this island are rare.

In December and April, and especially in the vicinity of these islands, the hurricanes occur, which render the navigation of this part of the Indian Ocean so dangerous.

We will resume in the following pages the hurricanes of the three great seas of the globe in a few general remarks. A special study of these terrible tempests would be beyond the province of this work.

Hurricanes\* take place in the three great seas of the globe—the Atlantic, the Indian, and the Pacific Oceans; the latter, *soit dit en passant*, could be more suitably called the *Great Ocean*. Hurricanes.

In the Atlantic Ocean the West Indies is the center of the most terrible hurricanes known; in the Indian Ocean, it is about the position of Rodriguez, Mauritius, and Réunion Islands; in the Pacific, where very few observations have thus far been made, it is supposed to be in the vicinity of the Tonga Islands.

In the West Indies and their vicinity the season during which hurricanes may be expected is that comprised between the months of August and October; they seldom occur in June or July. Period of hurricanes.

In the Indian Ocean hurricanes take place from December to April; that is, during the warmest months of the southern hemisphere; they seldom occur in November and in May, and are unknown during the other months of the year.

In the Pacific Ocean, to the south of the Equator, the known hurricanes have taken place in November and December, and they appear to have much similarity to those of the Indian seas.

---

\* For a more complete description of hurricanes, &c., we would refer mariners to the excellent treatise of M. Keller, hydrographic engineer, Paris, *Traité sur les Ouragans*, &c.; and also to *Silliman's Journal*; to Reid, *Attempt to develop the laws of storms*; to Thom, *Inquiry into the nature and laws of storms*; to Piddington, *Horn book of storms*; *Observations on revolving storms*, British Admiralty; and the *Memoir on the storms of the East Indies*, by Lieutenant Lefebvre.

The supposed extent of the zones where hurricanes are met with.

In the Atlantic Ocean, to the north of the Equator, the supposed extent of the zone where hurricanes are experienced is comprised between the latitude of  $10^{\circ}$  and  $50^{\circ}$  N., and the longitude of  $50^{\circ}$  and  $100^{\circ}$  W.

In the Indian Ocean the extent of this zone in longitude is three thousand miles—from the west coast of Australia to that of Madagascar—and is comprised between the latitude of  $6^{\circ}$  or  $8^{\circ}$  S. and  $22^{\circ}$  S.\*

Having indicated the different treatises published on hurricanes, we cite particularly that of M. Keller and the memoir of M. Lefebvre, and would refer all seamen to these works who may wish to familiarize themselves with the manner in which the general laws of storms are deduced from theory, as also the practical rules for escaping their violence; this subject does not enter into the plan of this memoir, in which we only state facts without searching for the causes. We will limit ourselves by giving the general laws of hurricanes, as deduced from numerous observations, and refer for the practical directions to the appendix at the end of this work. These tempests have a double movement; the one gyratory or rotary, the other of translation or movement from one place to another.†

Gyratory movement.

To the north of the Equator the gyratory movement is from the right to the left in passing by the N.; that is to say, in an opposite direction to the movement of the hands of a watch. In the southern hemisphere, on the contrary, it is from left to right in passing by the N. or in the same direction as the movements of the hands of a watch.

Movement of translation.

The movement of translation is upon a parabolic curve, the apex of which is always turned toward the W. and the branches throw themselves out to the E. The apex of this curve is tangent to the meridian about the latitude of  $30^{\circ}$  in the northern hemisphere, and about that of  $26^{\circ}$  in the southern hemisphere; that is to say, nearly at the polar limits of the trade-winds. The hurricane moves on this curve, in departing from the Equator; in other words, the point of departure of the hurricane is at the eastern extremity of the curve of its path nearest approaching the Equator, and in a latitude nearly equal to the declination of the sun; from thence the hurricane in the first half of its course is directed toward the apex of the curve or toward the W., then it

\* See the *General Examination of the Atlantic Ocean*.

† The following is taken from the treatise of M. Keller.

follows this apex as tangent to the meridian, bending afterward to the E., in the portion of the curve of its path the furthest removed from the Equator.

The velocity of the translation is in proportion to the violence of the tempest; in the mildest hurricanes observed it has not been less than ten miles an hour, and in the most violent it has not exceeded thirty miles.\*

Nearly all authors on this subject, observes Mr. Lefebvre, have sought to measure the diameter of the vortex, and, this diameter being known, to determine from the force of the wind and the falling of the barometer at what distance the observer was from the center. They have succeeded but indifferently; the diameter of the vortex of hurricanes is very variable. M. Keller states that the initial diameter of the gyratory movement is from  $3^{\circ}$  to  $4^{\circ}$  of the terrestrial arc and that it increases progressively as it advances until it attains  $8^{\circ}$  or  $9^{\circ}$  at the extremity of the curve of its path.

In the northern hemisphere, the vessels placed on the edge of the right parallel to the path of the center, and in the southern hemisphere those placed on the edge of the left, are those most injured.

A ship surprised by a hurricane perceives successively every direction of the rotary movement of the air on a secant parallel to the path of the center of the meteor;† these changes of direction never make the tour of the compass. When the secant traverses the center of the meteor, the wind changes sixteen points at the center perpendicularly to the line of translation and after an interval of calm.

On each secant the barometer falls gradually to the instant of the passage of the point nearest the center, then it rises progressively from this moment until the end of the tempest, which corresponds to the extremity of the secant. But, says M. Lefebvre, the violence of the wind is no more connected with the diameter of the vortex than the fall of the barometer is. The wind increases as the center is approached and the barometer constantly falls; this is all

\* M. Lefebvre states that for the Indian Ocean these velocities are too great, and he estimates for the movement of translation a velocity of from five to six miles an hour as a mean; for, he adds, hurricanes do not change their place but at a rate of velocity of two miles per hour. (*Memoir on the hurricanes of the Indies, &c.*, page 12.)

† Some authors state that in these tempests the wind attains a velocity of even ninety miles an hour.



that can be said. To attempt to establish a general rule on this point, would most likely lead to error.\*

Such, according to M. Keller, are the laws principally observed in hurricanes. These laws known, the attempt has been made to utilize them and to give to seamen the means of avoiding the violence of these terrible phenomena. The two problems to solve were these: 1. To determine in a hurricane the position occupied by the vessel in relation to the movement of translation of the meteor; 2. This position known, to determine which may be the best manœuvre to make to receive the hurricane or to cross it in the manageable semi-circle. The first problem is easily solved, and M. Keller has given us on this subject a very important general rule, which can be applied to every type of tempest, whether they have a convergent or divergent character; that is to say, whether the wind in turning describes a circle or whether it is directed from the circumference to the center of the vortex or from its center toward the circumference. The following is the principle on which can be determined, in every case, whether you are to the right or to the left of the path of the storm:†

“Every vortex, in moving, causes to be felt at fixed points on its passage to the left of the path of its center, a successive change of wind, turning, by compass, to the left, or in an opposite direction to the movement of the hands of a watch. It causes to be experienced, at points situated to the right of this path, a succession of winds which turn, by the compass, to the right, with the movement of the hands of a watch.”

Thus, when a hurricane threatens, by remaining one or two hours in nearly the same position, and observing with great care the successive variations of the wind, the position of the vessel with regard to the line of its path can be determined without difficulty, and, consequently, whether you are in the dangerous or manageable semi-circle.

In hurricanes of a rotary type it is very easy to determine

---

\* *Memoir on Hurricanes, &c.*, page 11.

† *Memoir on the Typhoon of 11th to 14th September, 1840*, page 3. In a memoir much more comprehensive, which includes the researches made by M. Keller on hurricanes, which is yet unpublished, the principle which we give here in so condensed a shape, will be accompanied by explanations &c., which will demonstrate its correctness and its practical application.

the bearing of the center of the tempest with regard to the vessel. We have said, in effect, that, in these tempests, to the north of the Equator, the wind turns from right to left, contrary to the movement of the hands of a watch; and that to the south of the Equator it turns from left to right. Then, whatever may be the space occupied by the tempest, the wind blows always in describing a circle. Evidently the center of this circle should be found on the perpendicular to the direction of the existing wind. Consequently, it is sufficient to determine by compass the direction of the wind, and the center will be  $90^{\circ}$  to the right, if in the northern hemisphere, and  $90^{\circ}$  to the left, if in the southern hemisphere.

In order to avoid error in this particular, the following table can be used, which gives at once, from the direction of the wind, the bearing of the center of the storm for each hemisphere:



| NORTHERN HEMISPHERE. |                      | SOUTHERN HEMISPHERE. |                      |
|----------------------|----------------------|----------------------|----------------------|
| If the wind is—      | The hurricane bears— | If the wind is—      | The hurricane bears— |
| N.                   | E.                   | N.                   | W.                   |
| N. by E.             | E. by S.             | N. by E.             | W. by N.             |
| N. N. E.             | E. S. E.             | N. N. E.             | W. N. W.             |
| N. E. by N.          | S. E. by E.          | N. E. by N.          | N. W. by W.          |
| N. E.                | S. E.                | N. E.                | N. W.                |
| N. E. by E.          | S. E. by S.          | N. E. by E.          | N. W. by N.          |
| E. N. E.             | S. S. E.             | E. N. E.             | N. N. W.             |
| E. by N.             | S. by E.             | E. by N.             | N. by W.             |
| E.                   | S.                   | E.                   | N.                   |
| E. by S.             | S. by W.             | E. by S.             | N. by E.             |
| E. S. E.             | S. S. W.             | E. S. E.             | N. N. E.             |
| S. E. by E.          | S. W. by S.          | S. E. by E.          | N. E. by N.          |
| S. E.                | S. W.                | S. E.                | N. E.                |
| S. E. by S.          | S. W. by W.          | S. E. by S.          | N. E. by E.          |
| S. S. E.             | W. S. W.             | S. S. E.             | E. N. E.             |
| S. by E.             | W. by S.             | S. by E.             | E. by N.             |
| S.                   | W.                   | S.                   | E.                   |
| S. by W.             | W. by N.             | S. by W.             | E. by S.             |
| S. S. W.             | W. N. W.             | S. S. W.             | E. S. E.             |
| S. W. by S.          | N. W. by W.          | S. W. by S.          | S. E. by E.          |
| S. W.                | N. W.                | S. W.                | S. E.                |
| S. W. by W.          | N. W. by N.          | S. W. by W.          | S. E. by S.          |
| W. S. W.             | N. N. W.             | W. S. W.             | S. S. E.             |
| W. by S.             | N. by W.             | W. by S.             | S. by E.             |
| W.                   | N.                   | W.                   | S.                   |
| W. by N.             | N. by E.             | W. by N.             | S. by W.             |
| W. N. W.             | N. N. E.             | W. N. W.             | S. S. W.             |
| N. W. by W.          | N. E. by N.          | N. W. by W.          | S. W. by S.          |
| N. W.                | N. E.                | N. W.                | S. W.                |
| N. W. by N.          | N. E. by E.          | N. W. by N.          | S. W. by W.          |
| N. N. W.             | E. N. E.             | N. N. W.             | W. S. W.             |
| N. by W.             | E. by N.*            | N. by W.             | W. by S.             |

The bearing of the centre of a hurricane from the vessel being known, it is certainly desirable to determine its distance; for this, however, no precise rule has as yet been found. Some very good inferences may be drawn from the quickness or sluggishness with which it appears to develop itself; from the increasing violence of the squalls; from the irregularity of the sea which rises in several directions, and, above all, from the rapid variations of the barometer.

A remarkable trait of the rotary gale is the increase of the wind in the vicinity of its center, although at the center itself it blows so irregularly, and by squalls, as to render it impossible for a ship to complete a manœuvre. The nearer the centre is approached the more sudden are the changes

of the wind, which, instead of shifting point by point, as is the case at the entrance of the circle of the tempest, it shifts all at once sixteen points. The ship is enveloped in a terrible squall, and gathers stern board against a frightful sea, the disastrous consequences of which it would be unnecessary to detail. The undulations and currents of hurricanes appear to be the constant results of these violent atmospheric shocks. These two phenomena deserve to be the subject of serious study and research.

The undulation of the hurricane is a mass of water of greater or less diameter, according to the force of the tempest, raised above the ordinary level of the ocean by the atmospheric pressure or other cause. This mass is driven before the storm in its course until it encounters some obstacle, as the mouths of rivers, bays, or coasts, when it often produces serious inundations, or heavy bores.

Undulations of  
the hurricane.

The currents of a hurricane can be briefly defined as circular currents, where the circumference of the tempest is of a rotary type. There are also in every hurricane two forces, independent of that of the wind, which act upon a vessel, the one drawing her directly in the line of the path of the storm, the other drawing her toward the circumference of that portion of the rotary circle where she is placed. Thus, while the drift due to the undulation of the hurricane sets toward the W., the current of the hurricane will set toward the W. on the northern position of the rotary circle; it will set to the E. on the southern part of this circle, to the S. on the western portion, and to the N. on the eastern portion of the same circle. If the rotary motion is from E. to W., passing by the N., as in the hurricanes of the northern hemisphere, the rotary motion would be in the opposite direction in the hurricanes of the southern hemisphere.\*

Currents of the  
hurricane.

Electricity seems to take a great part in hurricanes, though very often it may escape observation.

Among the thirty-two hurricanes of the Indian Ocean of which the data is precise, eleven have been accompanied by thunder and lightning, while in twenty-one no electric phenomena were observed. Thom† says that these phenomena are five times more frequent on the north side of the curve of translation of hurricanes than on the south side; that is,

\* *Inquiry into the nature and course of storms.* † *Horn book of storms.*



in the position where the monsoons of the W. prevail. He adds that it was so common for lightning in the N. and N. W. to precede a gale, that the Dutch captains when going from the Cape of Good Hope to India, had orders to reduce sail and take every precaution when they saw lightning.

In addition to the menacing aspect of the sky which generally precedes all storms, that thick circle round the sun or moon, clouds heaped up or distended with their gloomy lines of light and their fantastical colors, often of copper color, forming a heavy curtain at the horizon, with menacing points and lines of pale lightning, is known to every sailor. These clouds rise little by little, covering soon the whole horizon; in approaching the zenith squalls form before the strength of the tempest, the rain falls in torrents, and at the same time the hurricane bursts.\*

The barometer and sympisometer are most valuable instruments in the region of hurricanes, and should be attentively consulted. In these regions a great fall of the mercury below its ordinary level, never takes place without being followed by a tempest. We have given above its course in hurricanes.

Heavy rains always accompany tempests of a rotary type. At a distance of one hundred miles from each side of the rotary circle there is a heavy bank of clouds, giving out torrents of water without interruption, and this during several weeks.

We here terminate the discussion of the winds of the Indian Ocean, and will speak of those in the seas of passages and lastly in the China Sea.

#### THE SEAS OF PASSAGES.

We call *seas of passages* those formed by the islands comprised between the east coast of Asia and that of New Holland. We will only speak of the principal ones; the Java, the Moluccas, the Celebes, and the Sooloo Seas. The particular directions regarding the prevailing winds in the channels which connect these seas will be found in the special works on these localities.

How the monsoons are generally designated in the seas of passages.

In these seas two monsoons are distinguished to which seamen give the names of monsoons from the N. and the W., and from S. and E.; some say that the winds draw more from the N. than from the W., and more from the S. than

---

\* Lefebvre.

from the E. and *vice versa*. The former corresponds with the N. E. monsoon to the north of the Equator, the latter with the S. W. monsoon. It is known that the monsoons which prevail in these seas of passages are much less regular than in the open sea and that according to the seasons, the winds from N. and W. prevail in turn, as also those from S. and E. during the other monsoon.

It is remarked that in general to the south of the Equator, and as far as the parallels of  $10^{\circ}$  to  $12^{\circ}$  of latitude S., the direction of the wind varies ten or twelve points from that of the prevailing winds to the north of the Equator during the same period; that is, if to the north of the Equator the monsoon is from the N., it will be found W. N. W. South of the line, and if the monsoon is from the S. to the northward of the Equator to the south of the seas of passages, it will be found E. S. E. to E. In order to avoid the confusion arising from these different names of monsoons we will continue to designate them as the N. E. and S. E. monsoons.

In the Sea of Java, as in the Moluccas, the N. W. monsoon commences in the first fifteen days of November; it has no strength, however, until the end of December. It continues until the end of March, when there are intervals of calm, variable breezes, squalls, and storms.

Seas of Java and  
the Moluccas.

In these two seas this is the general law observed; but it should be recollected, as we have said before, that the winds sometimes approach more to the northward and to the westward and sometimes more to the southward and to the eastward; besides, the change of the monsoons does not take place at fixed periods. The S. E. monsoon is much more calm, and the wind is less strong in this, than in the N. W. monsoon.

Following these general remarks we will give some details of the coasts.

We have already spoken of the Strait and Islands of Sunda; without returning to it we will mention that in the Strait of Bally the winds frequently blow from the N. with considerable force; in the Strait of Sapy the alternate land and sea breezes are found, they blow from the S. in the morning and from the N. at about 2h. in the afternoon and are generally separated by an interval of calm. In the other straits to the east of Java the condition of the winds is similar, though, altogether, they are very variable.

Strait of Bally.

North coast of Java. On the north coast of Java, from May to July, the winds blow from S. E. with returns of the opposite winds varying as far as N. E. Near the west point of the island, during the S. E. monsoon, they are from S. S. E. varying to E. S. E.; this is the fine season. In October these winds grow light and variable.

October to April. The N. W. monsoon commences generally in October, sometimes in September, at others in November, and ends in March; it is the season of heavy rains. In December the winds from the W. prevail. Toward the middle of February there are squalls and storms accompanied by rain.

Batavia. At Batavia, from April to November, the weather is passable; during the remainder of the year it rains.

South coast of Borneo. On the south coast of the Island of Borneo; that is, from Pulo Laut to the Strait of Sunda, the S. E. monsoon prevails from May to September, as also to the west of Java. At this period, in the Indian Ocean, the S. W. monsoon is established to the northward of the line. From September to April the winds from the W. blow on this coast, the rains are continual, and the weather often very bad; during the S. E. monsoon the weather, though always moist, is less rainy than during the N. W. monsoon. It can be said that, at Borneo it rains eleven months of the year.

Straits of Carimata, Gaspar, and Banca. In the Straits of Carimata, Gaspar, and Banca, the winds are often found from the N. W. when the monsoon is N. E. to the north of the line.

We will now take up the islands of the Sea of the Moluccas.

Islands of Bouru, Ceram, and Amboyna. To the north of Bouru and Ceram the S. E. monsoon varies from S. S. E. to S. S. W.; at the Island of Amboyna from the E. to S. E. In these islands, the N. W. monsoon varies from N. W. to W. S. W. This, called often the W. monsoon, is the season of storms in these islands; it ends in April. The monsoon from S. E. commences in March and lasts until November; it is the rainy season. During this monsoon there are violent storms, and the rains are very heavy around the large islands of the archipelago. In November this monsoon ceases. The monsoon from N. to N. W. is not, however, established until long after; during two months the winds are variable, as they may be said always to be, in these close seas, toward the end of the monsoons. From October to April the weather is quite good. In the Moluccas, which occupies a space of 5° to the

south of the Equator and  $1^{\circ}$  to the northward of it, the winds are irregular, owing to the great difference between the monsoons prevailing at the same period in the two hemispheres.

On the west coast of New Guinea there are two monsoons; that from S. E. lasts from April to October; the other, from N. W., commences at the end of October and ends toward April. In January, near this island, there are at times winds varying from N. N. W. to N. E. In the spring the weather is often variable; in March, April, and May there are storms and some rain squalls. From June to September there is much rain; from October to May the weather is serene and pleasant; at this season there are neither mists nor clouds.

West coast of  
New Guinea.

The Island of Celebes, as that of Borneo, is divided into two parts by the Equator, and the same phenomena are reproduced upon the coasts of this island as have been mentioned in speaking of Borneo and Sumatra. On the south coast the S. E. monsoon is established from May to October, then the S. W. monsoon prevails on that portion of the island to the north of the Equator.

Island of Celebes.

The S. E. monsoon, which lasts from May to October on the coast of Celebes, situated to the south of the Equator, is the least wet season. The N. W. monsoon takes its place toward the middle of October and lasts until April, the rains are then almost constant with, sometimes, heavy winds. During the two months when the sun is near the parallel of the islands, and about the full and change, there are, exceptionally, winds from the N. and rain. On that part of the island, to the north of the Equator, the N. E. takes the place of the S. W. monsoon in October and is the season of good weather.

In the northern part of the Strait of Macassar, from May to October, there is a monsoon from the S. E., as upon the coast of Borneo, this monsoon exists also between Celebes and Gilolo; it is replaced by the N. W. monsoon which lasts from November to April.

Strait of Macassar.

In the southern part of the strait the wind is N. E. in April, May, and June; it is weak in August and September. During October, November, and December, as in the following months, there are, in these localities, fresh winds from W. S. W. to W. and W. N. W.\*

---

\* Carteret.



Near the west coast of Celebes, from May to October, the land and sea breezes blow, while on the opposite coast of Borneo, the winds are regular from the S.

From November to April, on the west coast of Celebes, the winds vary from W. S. W. to W. N. W.; in April, May, and June they are from N. E.; they are light from this direction in the month of August.

It has been observed that when the S. W. wind prevails on the coast of Celebes it ceases at about eighteen miles from the coast, and hauls to W. N. W., and N. W. on the coast of Borneo.\*

During the S. E. monsoon, from May to October, a vessel cannot work up against it on the low coast of Borneo.† During this season, on this coast there is but little land and sea breeze, while on the corresponding coast of Celebes, which is high, there are during the night fresh winds from the land followed by sea breezes in the day.

In December the alternate breezes are also found near Celebes. In the vicinity of this island the winds which prevail in August and September are light; there are sometimes squalls from the S. W. and long calms.

Seas of Celebes  
and Sooloo.

In the Sea of Celebes and Sooloo Archipelago the winds from E. commence in October; they are not, however, regular until November. They bring fine weather. In May the W. winds take their place and are fully established in a month after, and last until October; this is the season of rains, squalls, and storms which take place principally in July and August. In September there is much fog near the coast of Mindanao.

At the commencement of the W. monsoon the winds are light for a considerable interval; there are squalls of rain in which the wind blows from an opposite direction—from the eastward; this continues sometimes for a week; there are also violent squalls occasionally, until the wind becomes decided at W. During all this monsoon the weather is overcast, rainy, and often stormy. At the same period, between Mindanao and Celebes, sudden and violent squalls occur from the N. W.\* Sometimes the winds from W. continue to November.

In the Sooloo Sea the E. or N. E. monsoon is not a regular and fresh wind, and the winds are often variable. In the vicinity of Mindanao the winds from the N. are never

\* Carteret.

† Forest.

strong, and often for several days light and variable winds take their place; such is the case at the end of January. It is considered that the same winds exist from the Sooloo Archipelago to Manilla.\*

In the Sea of Timor, and between the Arrou Islands and the north coast of Australia, as also in the vicinity of Torres Strait, the S. E. monsoon blows with much regularity.†

From May to August it varies from E. S. E. to S. E., and is then very strong. The Malays call this period the *white weather*. In the beginning and toward the end of the monsoon, the wind holds mostly at E., sometimes hauling as far as E. N. E. During this monsoon the breeze is generally fresh and steady at the quartering of the moon, and the winds are variable, with calms at the syzygies. This has also been observed with regard to the trade-wind on the east coast of Australia.

In Torres Strait the easterly winds predominate. The W. monsoon does not blow regularly, and is often modified by winds from the E., which are weak and variable, and last some days, until the W. wind blows again fresh.

Between Papua or New Guinea and Australia, during the month of January, and at the commencement of the W. monsoon, the winds are principally from N. E. to N., returning from time to time to W.

Near the northeast coast of Australia, as far as about the parallel of 14° S. latitude, the winds varying from N. E. to W. N. W. prevail, and more to the south they haul to E. and E. S. E.

Between the two monsoons there are often long calms, which mostly prevail at the period of the change of the monsoons; the winds from W. blow five or six days, they then cease, and sometimes for a lunar month they are light and variable; then at the following syzygy the regular monsoon is established, accompanied by overcast weather, with rain and sometimes squalls, which lasts two or three days. The sky then clears, and a moderate breeze blows for a certain interval, with clear and even as fine weather as in the S. E. monsoon. Two or three days of bad weather should be expected at the period of the syzygies, although there may be sometimes five or six weeks of continuous fine weather.

---

\* Dalrymple.

† Captain McKensie, (*Nautical Magazine*.)

In the vicinity of the land there are always more squalls and rain than in the offing. However, at the limit of the monsoon, in latitude  $15^{\circ}$  S., the weather is usually rainy and squally. The mean direction of the wind is about W. N. W., hauling to N. W. and S. W. at the epoch of the syzygies, during which it is often W. S. W.

## CHINA SEA.

In the China Sea there are two monsoons, called the S. or S. W., and the N. or N. E. monsoons; they succeed each other at an interval of six months, the S. W. monsoon blowing from May to October; the N. E. from November to May. These monsoons have a great influence on those of the neighboring seas.\*

The monsoons are not established at the same time at all the points of this sea, which is also the case in the Indian Ocean.

**S. W. monsoon.** On the west coasts the S. W. monsoon commences in April, and is not established at sea for a month after. It is not established on the north coast of Borneo, at Palawan, and at the Philippine Islands until from the middle to the end of May; it is also found later to the south than in the northern part of the China Sea.

The same monsoon in the Java Sea, and in that of the Moluccas, is not found regular until a month after it is established in the China Sea.

The S. W. monsoon lasts six months, when, as in India, it ceases on the coast before it does at sea. The N. E. monsoon, which succeeds it, also extends gradually to seaward and to the south. Thus, to know the period when a monsoon should commence at any particular locality, it suffices to know when the opposite monsoon commenced, giving it a duration of six months.

**May.** During the month of May there are often at sea light and variable breezes with the S. W. monsoon. There are sometimes, during one or two days, accidental winds from the E. or S. E. This is particularly the case in the north of the China Sea, and occurs in both monsoons.

**June, July, and August.** During the S. W. monsoon there are generally, and particularly from June to August, heavy rains, with bad weather or gusts of wind. During these months, in the vicinity of

---

\* D'Après de Manneville, Horsburgh.

Formosa and in the channel which separates it from the coast of China, winds often blow, varying from N. to E. In these three months the S. W. monsoon is in full force and is least variable. .

In September the winds often vary from N. E. to E. and to S. E. Nevertheless, in this month the S. W. winds prevail. They last thus until the syzygy of the commencement of October. Then the monsoon changes, and a storm generally occurs at this period from the S. W., varying to W. and N. W., with heavy rain, when the wind turns successively to N. N. E. and E. N. E., and the N. E. monsoon commences. September.

The month of October is a bad month for navigation in the China Sea; it is generally rainy, though toward its end the weather becomes good. October.

The N. E. monsoon commences on the west coast toward the 15th of October. In the southern part of this sea it is rarely felt before November. In certain years the weather is fine in September and October, and the N. E. monsoon does not commence with a gust of wind. It is strongest in December and January. There is sometimes rain in this monsoon, which is always accompanied by a heavy swell, especially in the vicinity of Pulo Sapata, and from this island to the Strait of Singapore. There are, however, intervals of good weather. N. E. monsoon.

The variable winds in October, November, and the commencement of December, which blow on the coast of Palawan, allow a course to be steered N. E. and S. W. The sky is frequently overcast and cloudy.

The monsoon diminishes in strength in February. During this month and March it is moderate, and the weather is fine in the China Sea. February and March.

At the end of the monsoons, or when they become weak, the land and sea breezes are found on the coasts. In March and April they are freshest and the most regular. At the end of September and the beginning of October they are lighter than during the foregoing months, and less regularly established. At the periods of the change of the monsoon the winds are variable. These epochs are marked by storms, and those of the equinox of September are particularly formidable, as also those in October. In these months, and also in November, there are strong winds and calms of short duration. After these general remarks, we will men- Alternate breezes. March and April.

tion more particularly the coasts which surround the China Sea.

East coast of  
the Peninsula of  
Malacca.

On the east coast of the Peninsula of Malacca, the weather is fine from April to October, while on the western coast it is bad. In June, on the east coast, during the day, the winds are from S. E., and in the evening they turn toward the W., and blow from this direction until 10h. or 11h. in the forenoon. During the N. E. monsoon the rains are constant on this coast, and the change from the S. W. to the N. E. monsoon is often marked by violent tempests. The return of the S. W. monsoon is not, generally, attended by storms of so violent a character.

Gulf of Siam.

In the Gulf of Siam the monsoons commence and finish sooner than in other parts of the China Sea, and the winds are generally less regular.

S. W. monsoon.  
April to Sep-  
tember.

The S. W. monsoon commences in the month of April, with rains which continue during May and June.

In July, August, and September, there are also rains with winds from the westward.

On the coast of Siam, from March to May, winds from the S. are often found, and from June to August they are met with from S. W., very strong near Pulo Oby. From the month of September the winds become variable.

From October  
to January.

In October the monsoon changes in a gust from the S. W. In November the weather is fine and the wind regular at N., as also in December and January.

February  
March.

In the month of February, the wind varies from S. to E. During this month and the first days in March the regular land and sea breezes blow.

During May, June, and July, the period when the S. W. monsoon is in full force, it has been observed that a land breeze prevails, which lasts from three to twelve days.

Coast of Cam-  
bodia.

On the coast of Cambodia, in June, July, and August, there are heavy rains, with strong winds from the S. W. On this coast the monsoons are not regular. The land and sea breezes commence when the prevailing monsoon becomes light. They last but from four to six hours during this monsoon, and are not so fresh as those at the termination of the N. E. monsoon.

Pulo-Timoan  
and Pulo-Con-  
dore.

At the Islands of Pulo-Timoan and Pulo-Condore the N. E. monsoon commences about the 15th of October, and brings fine weather. The S. W. monsoon brings rain, and lasts eight months. In November, in the vicinity of these

islands, there are calms, squalls with rain, and tornadoes. At Pulo-Condore the rains continue a month after the establishment of the N. E. monsoon. At Pulo-Timoan the winds commence to vary from the month of September, and the change of the monsoon takes place with bad weather. In November the weather is good.

On the coast, between the Gulf of Siam and the Cape Padaran, near the land, the S. W. monsoon blows parallel to the coast. In keeping near it there are sometimes during the night light land breezes, which are succeeded by an interval of calm. Then the monsoon returns and blows fresh during the day.

On this coast the N. E. monsoon is established at the end of September, or in the first part of October, and lasts until the middle of April.

On the coast of Cochin-China there is a kind of winter, with cold winds from the N., accompanied by rain, which last from December to February. The season of heavy rains is the months of September, October, and November.

During the N. E. monsoon there are frequent winds from the E. In that part of the sea, between the Paracels and the coast, these same winds are felt as far as Cape Varela. In the channel, between the Paracels and the coast, it is often calm, while to seaward of this bank the regular monsoon blows fresh.

During the S. W. monsoon on this coast, the land and sea breezes are quite regular, and the sea breeze is replaced every evening by the land breeze, though not always at the same hour. It is followed by calm or light breezes, which generally last until noon, when the wind commences from S. E. Near the coast of Cochin-China the winds are variable during the whole year, and the monsoons generally light. From this cause the leeward coast is not dangerous, even with the N. E. monsoon.

In the Gulf of Tonquin there are two seasons, the dry and the rainy season. The latter is that of the greatest heat. It commences about the end of April and ends in August. The rains moderate at this period, and in September and October the weather is passable.

In November the dry season commences. From the middle of this month there are strong winds from the N., varying to E. and E. S. E. toward the end of the month.

About the end of December the winds return from the N.

N. E. to E., accompanied by fogs. During January and February they blow from the N. E. and N. N. E. In April the weather is milder, and the winds more moderate. In the Gulf of Tonquin typhoons sometimes occur.

**Coast of China.** On the coast of China, from the Island of Hainan as far as Amoy, the S. W. and N. E. monsoons are found, subject to the variations mentioned in the general remarks on the China Sea. However, on that portion of the coast situated opposite to Formosa, the winds from N. are said to prevail for eight or nine months.\* During the N. E. monsoon, on the south coast of China, there are winds along the land from E. N. E. They vary, sometimes turning toward the coast, at others to the S. E. It is seldom that there are any regular land and sea breezes; those mentioned are rather solar breezes.

On the south coast of China, during the S. W. monsoon, the winds are frequently from S. and S. E. In June, July, and August there is much rain, and the weather is sombre and overcast.

**East coast of China.** On the east coast of China, north of Canton, and as far as the Chusan Islands, as has been already stated, there are two monsoons, from N. E. and S. W.

The N. E. monsoon, on the coast from Macao to the Chusan Islands, commences in October and ends, generally, at the commencement of May.† This monsoon is in full force from November to January. Usually it is a double reef topsail breeze for a frigate. The sea is quite heavy with these winds, which vary from N. E. to N. N. E. and N. Much sail cannot be carried, and the coast should be kept as near aboard as possible to avoid the sea.

**N. E. monsoon.** During the N. E. monsoon storms occur, lasting two or three days, which are supposed to be caused by a typhoon blowing in the vicinity. When this wind ceases, for several days the breezes are light from S. to E. It increases again for eight or ten days and blows very fresh, creating a heavy, short sea, especially at the entrance of the Formosa Channel.

In October, November, and December the weather is quite clear, and rain and overcast weather does not continue longer than twenty-four hours. From January to March the weather is misty and fogs are common. In April the N. E. monsoon loses its strength for a day or two, the

\* La Pérouse.

† Captain Mundy, (*Nautical Magazine*, 1846.)

breeze sometimes hauling to the S., when the weather becomes very overcast; and there are heavy squalls, with rain, from the N. E., until the middle of May.

The S. W. monsoon, varying from S. S. W. to S., commences in June or July and ends in October. It is the season of gusts of wind and typhoons. S. W. monsoon.

In the zone occupied by the monsoons the rainy season on all the west coasts is the S. W. monsoon. On the contrary, on the east coasts it is the dry season. When the N. E. monsoon commences, the east coasts have their rains and the west coast their dry season.

The Formosa Channel, comprised between the Island of Formosa and the coast of China, is remarkable for its continual bad weather and storms. In the summer, and even during the middle of the S. W. monsoon, sharp squalls occur, with much rain. Formosa Channel.

In the passage of Formosa, between this island and the Philippines, there is bad weather at all seasons. During the N. E. monsoon, the winds blow principally from the E. N. E. as far as the mouth of the passage, where they take the direction of N. by E. and N. N. E. In the vicinity of the Bashee Islands they are from N. E. and E. N. E., raising a heavy sea. Often along the east coast of Formosa there are variable winds from the eastward, which blow well to the northward of this island, where they return to the N. N. E. It can be regarded as a general rule that when the wind hauls gradually to the S. of E., it will soon return to the N. with redoubled force. Very strong breezes from N. W. blow sometimes on the north coast of China for several days together, and are felt for a considerable distance seaward. The barometer is not to be relied on for foretelling the ordinary gusts of wind. It is very high, with the violent winds from the N. which often prevail. When the wind has gone round the compass, it generally returns suddenly and strong from the N., when sail should be reduced in time. Formosa Passage.

In the Philippine Islands there are the two regular monsoons which blow in the China Sea. These monsoons extend sometimes as far as the Marianas, or Ladrone Islands, in the Pacific Ocean, and to the north on the coast of Japan. The Philippines forming a group running north and south, the high land of these islands presents an obstacle to the regular course of the winds. It results that as far as one Philippine Islands.



hundred and twenty to one hundred and fifty miles from these islands the weather is generally bad, occasioned by their influence upon the currents of the air, and this bad weather increases as the islands are approached.

**N. E. monsoon.** The N. E. monsoon commences toward the month of October. The weather is then fine until April, and the winds variable from N. to N. E. If they pass to the N. W. accidentally, they blow with violence.

**S. W. monsoon.** The S. W. monsoon is not felt until between the beginning and end of May, and is not regular before June. During this monsoon the weather is overcast, cloudy, and very rainy.

**Storms.**  
**Philippine Islands.** At this period there are at times very severe storms called *collas* and *tempestades*. They are most generally accompanied by thunder, lightning, and rain, while the wind blows from every point of the compass with equal violence.\* These storms and the worst weather take place from the end of July to the middle of August, and sometimes in October. They resemble typhoons, of which we will speak hereafter.

In the month of September the winds are more moderate, the rains diminish and the sky is more clear; then, during the mornings, there are very thick fogs which last until noon. At the change of the monsoons, as in the China Sea, bad weather may be expected.

**Island of Luzon.** On the coast of Luzon, from February to March, at the end of the N. E. monsoon, the winds vary and have often a tendency to take the direction of the regular land and sea breezes or of solar breezes. During April the alternate breezes are well established. From June to October, the period when the S. W. monsoon prevails, the winds which blow perpendicular to the coast bring rain.

**Island of Palawan.** The Island of Palawan presents nothing special; the monsoons in its vicinity are those of the China Sea. Near the west point of the island, however, in September and during a part of October, there are strong breezes from S. W., accompanied by overcast and rainy weather. On the north coast in these two months and in December the winds are variable and allow a vessel to lay along the coast in going from N. E. to S. W., and *vice versa*. The weather is generally overcast at this period.

**Island of Borneo.** The Island of Borneo bounds the China Sea on the north-west side. It is divided into two parts by the Equator; Northwest and west coast.

\* *Les Philippines*, by J. Mallat, vol. i, p. 109.

from which it results, as in Sumatra, that the monsoons of the northwest coast are not, at the same period, those of the west coast; thus the S. W. monsoon prevails on the northwest coast from May to October, while at the same time the S. E. is established on the west coast; and the N. E. monsoon blows on the northwest coast, while the S. W. prevails on the west coast.

The S. W. monsoon is established in the northern part of Borneo between the middle and last of May; the rains are then constant. In September, the weather is better and the season of least moisture commences with the N. E. winds, varying to E.; this cannot be called a dry season, for, from its position on the Equator, this island is constantly deluged with rain.

On the west coast the S. E. monsoon commences toward the end of May, and brings good weather. From September to April the monsoon is from W. to N. W., with continual rain.

We will now mention the typhoons,\* which extend over a part of the Philippines and the China Sea. They reach sometimes as far to the westward as Calcutta, as was the case with the typhoon of 1831. Typhoons sometimes are not preceeded by any signs which would give seamen warning of their approach; at times they are preceded by fine weather, with a clear sky and a fresh or moderate wind generally blowing against the prevailing monsoon, which is the S. W., for the typhoons take place only from June to November. Often, before a tempest of this kind, a heavy black cloud may be seen on the northeast horizon, with its upper border of a copper tint; its color becomes brighter as it rises and its extremities show whitish; as soon as it rises and commences to move rapidly, the typhoon bursts, with thunder, lightning, and rain; sometimes an hour of calm succeeds the tempest, which lasts generally twelve hours; then the wind from S. W. blows with almost equal violence, as if to restore the equilibrium.

The barometer is the best indicator of these tempests; in the vicinity of the coast of China they commence, generally, from N. W. to N., afterward the wind flies to the N. E. and E., from whence it blows with violence, raising a very heavy sea and creating a strong current to the W. The wind then turns from E. to S. E. and S., when it mod-

\*Ty-Foong, or strong wind.

erates. The rotary movement in this direction in a typhoon only occurs in those which ravage the coast of China; for, at one hundred and twenty or one hundred and eighty miles from the land this motion is reversed, and commencing at N. to N. W., instead of hauling to the N. E. and E., they pass, on the contrary, to N. W. and W., where they blow with violence, and diminish in force as they approach the S. W. and S.\* These typhoons rarely occur more than once in an interval of three or four years; the zone in which they blow, extends from about the parallel of  $30^{\circ}$  N. to  $10^{\circ}$  N., although they rarely pass  $16^{\circ}$  N. latitude; in longitude they appear to occupy the portion of sea between the coast of China and  $148^{\circ}$  E.

In the preceding, we have given the general observations on the winds which prevail in the Indian Ocean, upon its coasts, and in the neighboring seas. We will now speak of the currents.

---

\* Horsburgh.



averse  
f the  
ean or  
er-cur-  
Cape  
ope.

ture.

mean ve



## CHAPTER II.

### GENERAL CURRENTS.

In the Indian Ocean the equatorial current is only found between the parallels of  $10^{\circ}$  and  $25^{\circ}$  S. latitude; that is, in the limits of the zone of the S. E. trade-winds. It commences to be felt about the meridian of  $102^{\circ}$  E. longitude, and extends to the coast of Africa, with some changes, which will be mentioned. On the meridian of  $102^{\circ}$  E. it receives the traverse current of the Indian Ocean, which we will first describe.

The traverse current of the Indian Ocean, or the counter-current of the Cape of Good Hope, is formed by two currents; the first a branch of the traverse current of the Atlantic Ocean, the second a branch of the Agulhas Current, which returns to the Indian Ocean a portion of the waters taken to the S. W. and S. along the coast of Africa. Finally, in the traverse current of the Indian Ocean, returning to the E., are mingled the waters descending from the South Pole toward the Equator, which modifying its direction, causes it to take that of E. N. E. to N. E.

At Cape Leeuwin, the southwest point of Australia, the traverse current of the Indian Ocean is divided into two branches, the one going to the N. along the west coast of Australia, blends with the equatorial current nearly in the latitude of the Tropic of Capricorn; the other called the Current of Australia, is directed to the E. and E. N. E., following the south coast of this continent and extending from the coast as far as the parallel of  $40^{\circ}$  S. latitude. To the southward of this parallel the currents are generally variable.

The temperature of this current, on the parallel of  $40^{\circ}$ , has been found to be  $57^{\circ}$  Fahrenheit; on that of  $30^{\circ}$ , from  $67^{\circ}$  to  $70^{\circ}$ ; this last temperature was attained between the meridians of  $92^{\circ}$  and  $102^{\circ}$  E. longitude.

The velocity of the traverse current at the surface of the Indian Ocean, is very variable; it is influenced by the winds, and but little information has been gathered regarding it. In the vicinity of Cape Agulhas and on its meridian the mean velocity of the current is about thirty miles per day;

The traverse current of the Indian Ocean or the counter-current of the Cape of Good Hope.

Temperature.

Velocity.

the breadth of its bed often is from two hundred and ten to two hundred and forty miles, and is generally found between the parallels of  $36^{\circ}$  or  $37^{\circ}$  S., and those of  $40^{\circ}$  to  $42^{\circ}$  S.; it enlarges as it advances to the E., and it would be difficult, owing to the elements from which it is formed, to assign it any precise limit. This current is especially useful to ships from the Atlantic which traverse the Indian Ocean from west to east to the Grand Ocean.

From St. Paul Island to Cape Leeuwin, Captain Torin states that he was once carried thirty miles to the eastward during the traverse, the duration of which he does not mention; a second time sixty, and a third time two hundred and two miles. He concludes from these three passages, made in October, November, and December, that the strength of the traverse current increases as the season advances.\*

Current of  
Australia.

The branch of the traverse current, called the Current of Australia, after passing along the south coast of this continent, spreads gradually as it advances to the E., and does not penetrate into Bass's Strait, where tides and variable currents are found, depending generally on the winds. It turns to the south of Van Diemen's Land, and its northern limit is nearly at the parallel of  $45^{\circ}$  S. latitude. It then enters the Pacific Ocean and mixes with the traverse current of that sea, to which it contributes.

Temperature.

Near Cape Leeuwin, and to the west, the temperature of this current varies from  $65^{\circ}$  to  $60^{\circ}$  Fahrenheit, it diminishes then as it advances to the E., and on the meridian of Van Diemen it is from  $48^{\circ}$  to  $49^{\circ}$ , at its minimum; it then increases when the current enters the Pacific Ocean.†

Velocity.

The velocity of the Australian Current is quite variable. Near Cape Leeuwin it has been found twenty-eight or twenty-nine miles per day; going to the eastward toward Bass Strait it decreases and varies from sixteen to thirteen miles. At the southern limit of the Australian Current, there is usually a counter-current directed toward the W. and N. W. with a very variable velocity. But few observations have been made on the Australian Current, which Flinders regards as a continuation of the traverse current of the Indian Ocean.

Equatorial current.

The equatorial current, as before stated, is not found in

\* Captain Torin, of the ship *Coutts*.

† Chart of currents of the *Venus*, by M. Dortet de Tesson.

the Indian Ocean, except to the south of the Equator. Its northern limit follows nearly the equatorial limits of the S. E. trade-winds; that is, the parallel of  $10^{\circ}$  S. latitude. On the meridian of  $102^{\circ}$  E. longitude, its southern limit reaches often to the parallel of  $25^{\circ}$  S.; but as the equatorial current advances to the W. this limit tends to the north, diminishing more and more the breadth of the bed of the current, which on the meridian of the Island of Rodriguez, only extends from the parallel of  $10^{\circ}$  to that of  $20^{\circ}$  S. latitude.

On the meridian of the Island of Rodriguez, it is divided into two branches; one directed to the S. W. surrounds the Island of Mauritius and its northern limit, passes to the south of the Island of Réunion, then to the south of Madagascar, on the meridian of which this branch is four hundred and eighty miles broad, with a temperature of from  $75^{\circ}$  to  $76^{\circ}$ . From this meridian it diminishes its breadth rapidly and running to the S. W., it mixes with the Current of Agulhas a little to the south of Port Natal. At the point of junction, the breadth of the bed of this current is not more than about seventy or eighty miles and its temperature has been found to be from  $70^{\circ}$  to  $72^{\circ}$ .

In that portion of the sea, between the Agulhas Current, the S. W. branch of the equatorial current, and the west coast of Madagascar, there are very variable currents; they run frequently to the E. S. E. and S. E., near the northern limit of this current, and to the N. or N. E., near the eastern limit of the Agulhas Current. The velocity of these counter-currents is often considerable, sometimes fifteen or twenty miles per day.

As already stated, the S. W. branch of the equatorial current envelops the Islands of Rodriguez and Mauritius, but does not reach Réunion, near which, to the north and east, are often found currents running to N. W., N. N. W., and N.

Near this island the velocity of the S. W. branch varies from ten to fifteen miles per day; near the south point of Madagascar it has been found from forty to fifty miles.

The W. branch of the equatorial current, which can be regarded as a continuation of this current, runs to the N. W., passes to the north of Madagascar, and mingles with the Current of Mozambique, which runs along the east coast of Africa, on the meridian of Madagascar, in the vicinity of Cape Amber, before its junction with this current; its ve-



locity has been observed at from forty-five to sixty miles per day, and its temperature  $75^{\circ}$ . The mean breadth of this branch is three hundred and sixty miles. After its junction with the Current of Mozambique, the equatorial current loses its name and the two descend to the south, along the east coast of Africa, where in the latitude of Port Natal they are called the Agulhas Current. This turns round the southern coast of Africa and is divided into two branches, about the meridian of  $22^{\circ}$  E. The first empties into the traverse current of the Indian Ocean, as before stated; the second enters the Atlantic, mounts to the N. N. W. and N. W. along the west coast of Africa, and is lost in the equatorial current of the southern hemisphere of this sea.

Velocity of the  
equatorial cur-  
rent.

The velocity of the equatorial current is very variable; it is, however, at times, as much as twenty or twenty-two miles per day. Its mean velocity is estimated at twelve to sixteen miles. The temperature of this current, from its origin as far as the meridian of the Island of Rodriguez, increases gradually and varies from  $72^{\circ}$  to  $81^{\circ}$  in this distance.

Current of  
Mozambique.

During the whole year, particularly about the Equator, there is a constant current along the coast of Africa from N. E. to the S. W., which runs toward the Mozambique Channel, and takes from it its name. It acquires in this channel a great velocity, particularly abreast of Cape Corrientes. At Cape Padrão the Mozambique Current changes its name and takes that of the Agulhas Current, or Current of the Cape of Good Hope. At this point it receives the S. W. branch of the equatorial current; the velocity of this current is greater near the coast than to seaward.

Velocity.

The mean velocity of the Current of Mozambique varies from eighteen to twenty-eight miles per day. In the vicinity of Cape Corrientes, some captains affirm having found one hundred and thirty-nine miles current per day, under particular circumstances. There is no instance of so rapid a current, other than perhaps the maximum velocity of the Gulf Stream. The Current of Mozambique is more rapid during the S. E. than with the opposite monsoon, which is said to be due to the accumulation of waters on the east coast of Africa by these winds. Its breadth is very variable, depending on the point of the coast to which it is opposite.

On the west coast of Madagascar there is generally a counter-current running toward the N., and which is supposed to be produced in part by the Current of Mozambique.

Counter-current on the west coast of Madagascar.

In the latitude of Cape Guardafui, and to seaward from this cape, the temperature of the Current of Mozambique has been found to be  $87^{\circ}$ . It diminishes rapidly in descending toward the S. In the Mozambique Channel it is not more than  $65^{\circ}$  or  $66^{\circ}$ ; it increases on receiving the warm waters of the equatorial current, and at Port Natal it varies between  $72^{\circ}$  and  $74^{\circ}$ .

Temperature.

The Agulhas Current was specially observed for the first time by Major Rennel in 1777. This current attains its greatest velocity in the winter, and is most rapid on the edge of the bank of soundings, or a little outside.\* Near the coast it is very weak. This is very important to ships entering the Indian Ocean from the west; they should keep near the land. In going to the west, on the contrary, they should keep near the edge of the bank, as the current follows its contour. Although this current almost always exists and in all seasons, it happens that different circumstances, among others, gales from the W. and S. W., diminish its velocity and sometimes completely annihilate it. In this case it returns with increased velocity when these winds cease. At other times it continues in the face of the most violent gales, and raises a frightful sea; then vessels should hug the land, where the winds are more favorable, the sea smoother, and the current more moderate.

Agulhas Current.

We have given here the preceding remarks, as very important in passages from the Atlantic to the Indian Ocean, and *vice versa*.

The velocity of the Agulhas Current is very variable; it has been found as little as fifteen, then from seventy to eighty, and even one hundred and twenty miles per day.

Velocity of the current.

In June, July, and August, between the meridians of  $40^{\circ}$  and  $37^{\circ}$ , and the parallels of  $30^{\circ}$  and  $30^{\circ} 30'$  S., the current between the coast of Africa and Madagascar runs generally to the W. S. W. as far as the east edge of the Agulhas Bank. Near the coast of Port Natal its direction is S. W., along the land, until it meets the edge of the bank between the merid-

General direction of the Agulhas Current.

\* This may be correct, although it does not agree with the observations generally made on currents which run along a coast, their velocity being greater generally near the coast than seaward. D'Après de Manneville expresses an opinion contrary to Rennel.

ians of  $29^{\circ} 50'$  and  $30^{\circ} 20'$  E.; there it gathers more force to seaward, and runs nearly W. by S., and W. S. W., along the edge of the bank as far as  $23^{\circ} 20'$  E. On this meridian the edge of the bank runs to the S. W., and then S. S. W.  $\frac{1}{2}$  W., to its southern extremity; there also the current changes; it runs to the S. W. as far as the meridian of  $22^{\circ} 20'$ , and from this meridian S. W. by S. to the southern extremity of the bank. Here the current has rarely a great velocity beyond the parallel of  $36^{\circ} 30'$  S., and the meridian of  $20^{\circ}$  E. From this point there is an inconsiderable current setting to the W., which is lost in the Atlantic Ocean. The strength of the current turns the bank of soundings and runs to the N. W. as far as the Cape of Good Hope. This N. W. current does not often attain half the velocity of the S. W. current along the southeast edge of the Agulhas Bank.\*

Counter-current  
of the Cape.

A counter-current, or current running to the east, increased by the waters of the traverse current of the Atlantic, is often felt on the southern limit of the Agulhas Current. It is generally found between the parallels of  $36^{\circ} 30'$  and  $40^{\circ}$  S.; the strength of this current has been indicated above, in speaking of the traverse current of the Indian Ocean, into which this counter-current empties. For the continuation of the Agulhas Current we refer to the *General Examination of the Atlantic Ocean*.

Variable cur-  
rents, north of  
the Equator, in  
the Indian Ocean.

These are the only currents in the Indian Ocean which can be called general currents; in this sea, to the north of the Equator, in the seas of passages, and the China Sea, the periodical winds, the alternate breezes, and the changes of the monsoon produce currents which are very variable, their direction depending upon that of the winds which produce them, the form of the coast, and other causes. We should exceed our limits in giving them in detail and will limit ourselves to observations on those upon the most important coasts, which have a certain regularity. As to the others, although we think their study would be useful, we will refer to the special directions which treat of the navigation of the Indian Ocean.

Arabian Gulf  
or Gulf of Oman.  
N. E. monsoon.

To the north of the Equator, in the Gulf of Arabia, or Gulf of Oman, the currents follow the direction of the winds;† in this vast gulf the currents are seldom considerable, except in August and September, the period when the great

\* Horsburgh.

† D'Après de Manneville.

rivers emptying into the gulf by their swelling produce a current directed to the S. with a velocity varying from eight to thirty miles per day. These currents are felt to the parallel of  $20^{\circ}$  N. In October, with the N. E. monsoon, the currents run to the southward; in November they increase with the monsoon and their velocity at large varies from eight to thirteen miles per day; their direction is W. S. W., and S. W.; along the coasts of Arabia and Africa, their velocity is from eight to thirty miles; in January there is but little current off the coast.

In March the currents off shore are variable, and in April they run to the N. E., varying to N. N. E. and E. N. E.; their velocity is the same as in the preceding monsoon. S. W. monsoon.

The currents in the Red Sea appear to be entirely controlled by the prevailing winds. While the winds from the S. prevail the currents are directed to the N., and during the northerly winds they run to the S., it is probable that the velocity of the current increases and diminishes with the force of the wind, as during the time of the variable breezes which precede the periodical winds, there is little or no current. In the vicinity of Jeddah, the currents during the different seasons attain a velocity of one or one and a half mile per hour. To the north of Jeddah the currents are very variable during the whole year and depend entirely on the direction of the winds which, when strong, give them a velocity of twenty and even forty miles in the twenty-four hours. Currents in the Red Sea.

From May to October, in the northern part of the Red Sea, the level of the water is 23.6 inches lower than during the other months of the year, which is occasioned by the prevailing winds from the N. which blow at this period over the whole extent of the sea. They occasion a regular current which runs from the Strait of Bab-el-Mandeb and penetrates into the Gulf of Aden; this current is so rapid, that at times it cannot be stemmed with a good breeze from S. W. From October to May, when the southerly winds prevail in the lower part of the Red Sea, the currents change their direction and reflow with rapidity to the northward. The mass of water finding no issue accumulates in the northern part of this sea and acquires a higher level than at any other period of the year.

The temperature of the waters of the Red Sea has been found to be  $86^{\circ}$  in the Strait of Bab-el-Mandeb;  $84^{\circ}.5$  op- Temperature of the Red Sea.

posite Mocha; from  $84^{\circ}$  to  $82^{\circ}$  to the south of Jeddah;  $77^{\circ}$  in the northern part of the Red Sea, and  $71^{\circ}$  at the extremity of it.

**Coast of Arabia.** On the coast of Arabia, from September to March, in the N. E. monsoon, the currents run strong to the W.; in March and April they run to the S. W., and in June, July, and August to the E. Opposite Aden, from April to August, the currents run to N. N. E. and E., and from the latter month to March, they are directed to the E. S. E. and S. E. by E.\* From May to September the current penetrates into the Gulf of Persia and runs out from it during the other months; in March and April during the little she-maal, the currents run to the N., so that a ship working to windward is assisted by them twenty or twenty-five miles per day.

**Entrance of the Gulf of Persia.**

At Ras-Jask, from September to April, the current is directed toward the S., as also in the portion of sea between this part of the coast of Persia and that of Arabia which is opposite. This current extends to the parallel of  $23^{\circ}$  N.; it is very rare at this period that the currents run toward the Persian Gulf.

From March to September, during the northerly winds in the Gulf of Persia, the currents in the strait at its entrance run to windward with sufficient strength to allow a ship to gain twenty miles per day under reefed topsails. From October to March ships which enter and leave the Gulf of Persia should keep close to the Persian coast. From March to September it is better to keep mid-channel, or on the Arabian coast.

**Coast of Persia.**

From October, on the coast of Persia, with the N. E. monsoon, the current runs to the S. until March; in April it changes with the S. W. monsoon and runs to the N. during the following six months. However, when the S. W. monsoon is in full force; the current along the coast of Persia runs to the E. with considerable velocity.

**Current of the Indus.**

The Indus, the mouth of which is situated at the northeast angle of the Arabian Gulf, discharges into the sea a considerable mass of water, particularly from July to September, at this period, which is that of the swelling of the river; it forms a current directed to the S. near its mouth, which, enlarging as it proceeds, takes at its west and east limits a S. S. W. and S. E. direction.

---

\* Malham.

This current, having but a small spread at its origin and near the southern delta of the Indus, after a course of three hundred miles attains a breadth of two hundred and forty miles; its velocity diminishes gradually as the distance from its source is increased, and at the above distance the current is weak and is lost in the ocean.

In November the currents are generally weak and variable on the west coast of Hindostan, except in the vicinity of Anjenga, and from this point to Cape Comorin where they are sometimes quite strong from the S. E. On this fraction of the coast there are, in January, northerly currents. From November to March, the period of the N. E. monsoon and the fine season, it is seldom that there are any currents on this coast. In March and April, when the N. W. winds are violent, they cause a trifling current, setting to the S. E. along the coast, which does not exist at other times.

West coast of  
Hindostan.  
N. E. monsoon.

In May, along the whole west coast of Hindostan, the current sets to the S. with a velocity of from five to seven miles per day, which increases in the vicinity of Anjenga and Cape Comorin.\* It happens, however, that in May and June there is but little and sometimes no current in these localities. When, during this season, the winds turn to the S., the current takes a northerly direction; this is always the case on the north part of the coast and near Bombay. In these months, clear of the coast, the current is generally directed to the E. N. E.

S. W. monsoon.

In July, when the rains have swollen the rivers, the current commences to run rapidly to the S. along the coast. At the entrance to Bombay, it is seldom that southerly currents are found, the waters from the rivers running directly to the W. and returning with the flood. To the south of Bombay the currents run to the S. with a velocity of ten to fifteen, and even eighteen to twenty, miles per day. These currents, which also exist in August and September, are more rapid between Cochin and Cape Comorin. Their velocity to the middle of October varies from twenty to thirty miles per day. When the rivers overflow, in July and August, the current generally sets off the coast, though, under some circumstances, it sets on shore. Between Calicut and Anjenga, at the end of September and the commencement of November, there are accidental currents, hav-

---

\* D'Après de Mannevillette.

ing a velocity of one or one and a half mile per hour, setting to the S. E. or E. S. E.

Laccadive Isl.  
ands.

In coming from sea and approaching the Laccadive Islands, during the S. W. monsoon, the currents will be found to run to the S. and S. W., particularly in March; between the islands their direction is S. S. W. In the channel which separates them from the coast of Malabar, they run to the S. S. E. In the Nine Degrees Channel, the currents generally run to the S. W., rarely to the N. In February, March, and April their direction is toward S. S. E. The velocity of the current, in the S. W. monsoon, between these islands and the coast, is twenty, twenty-four, to twenty-six miles per day. Among the islands, or in the channels which separate them, it is from eighteen to twenty-two miles.\* In the offing, and one hundred and twenty or one hundred and eighty miles to the westward, the currents run to the W. or W. S. W., with a velocity of from eight to eleven miles.† D'Après de Manneville mentions that at all seasons the currents run to the W. between the Laccadives and the coast of Malabar, and that near these islands it is directed to the S. during the S. W. monsoon, with a velocity varying from fifteen to thirty miles per day. Between these islands there are sometimes found northerly currents of from eight to ten miles per day.‡

Maldives.

It has been observed that, near the Maldives the current runs most generally to the E. Local causes, however, modify it.

S. W. monsoon.

When the S. W. monsoon is in full force to the north of the Equator, in June, July, and August, the current runs toward the E. in the vicinity of the North Atoll, while at the same period, and particularly in July and August, when the S. E. trade blows to the south of the Equator, the currents run to the W. N. W., near the south part of the chain, in the equatorial channel, and near the South Atoll. To the eastward of the North Atoll they usually run toward the W. in March and April, and in the vicinity of the Southern Atoll to the E. N. E., from the Equator to the parallel of 4° or 5° S. This current, though at times weak and variable, has often a velocity of from fifty to sixty-five miles per day. In these months, to the northward of the Equator, from this circle to 8° or 9° N., the current runs to the S. W. In May it runs strong to the E. near the Equator.

\* D'Après de Manneville.

† Nicholson.

tor, and attains, at times, a velocity of fifty, and even seventy miles per day near the South Atoll, between the parallels of  $2^{\circ}$  N. and  $2^{\circ}$  S. latitude.

In the equatorial channel, and in the vicinity of the South Atoll, during the months from October to January, the current is directed toward the E., while at the same period it runs strong to the W. between the parallels of  $3^{\circ}$  and  $5^{\circ}$  N. in the space between the Maldives and Ceylon. Among the islands to the north of the Equator, at this period, the currents run to the S. W., and among those situated south of the line, to the S. and S. S. E. From this it is seen that the currents depend, in a great measure, on the N. E. and N. W., S. W. and S. E. monsoons, which prevail at the same period to the north and to the south of the group. At the epoch of the N. E. monsoon, on the meridian of Point de Galle, and particularly in November and December, the current is found to have a velocity of thirty to thirty-five miles. This velocity diminishes as it approaches the Equator.

N. E. monsoon.

In the Gulf of Manar, and abreast of it, during the N. E. monsoon, the currents are very uncertain; they have been found running to the S. W. with a velocity of eighteen or twenty miles. From May to September, during the S. W. monsoon, the waters run into the gulf with a velocity of eight miles per day. They go to the N., following the coast, enter Palk Bay, and run out between Point Calymere and Point Pedro.\*

Gulf of Manar.

On the east coast of Ceylon, during the N. E. monsoon, from the middle of September to February, and especially in October and November, in following the coast of this island, there is a strong current to the S.; it turns the south coast, and is directed to the W., as far as Point de Galle, and even to Colombo. Its velocity has been found, in general, to be from forty to forty-eight miles per day. Under some circumstances it has been found as much as ninety-four miles. At other times it is very weak.

Island of Ceylon.  
N. E. monsoon.

On the west coast of Ceylon, during the same monsoon, the currents are quite variable. Sometimes a fresh wind from N. N. E., blowing for one or two days, produces along the coast quite a strong current to the N. Under these circumstances, it appears to us that this current is but a prolongation of that which descends to the S. along the

---

\* D'Après de Manneville.



east coast, runs to the W. on the south coast of the island, and arriving at Point de Galle reascends near the west coast.

**S. W. monsoon.** During the S. W. monsoon this current is reversed on the south and east coasts, and takes a direction nearly opposite to that above indicated; that is, it runs to the E. on the south coast of Ceylon, and to the N. on the east coast. Its velocity is then not nearly as great as during the other monsoon, at least near the coasts of this island, and it diminishes as it is approached. Near its northeast part, however, it is found from ten to twenty miles per day.\*

From May to September it happens that there is no current on the east coast of the island, while in the offing it runs strong to the N. N. E. and N. N. W. When the wind blows strong from W., Nicholson says that the current ceases near the land and over a breadth of fifteen to eighteen miles.

The following is taken from observations made by Mr. John Buchanan, master of the light-vessel, on the Little Bassas Rocks:

*“January.—*During this month a strong steady N. E. monsoon prevails. The S. S. W. current never shifts, but continues throughout January running from the Bay of Bengal with a velocity varying from two to three and a half knots. Sea cross and very rough all the month. Steam vessels steering N. N. E. have remained in sight from the light-vessel for two hours, and sailing ships for six days; hence ships bound to the northeast should avoid the south-east coast of Ceylon in January.

*“February.—*The same remarks apply to February, although toward the end of the month the wind becomes much lighter; the current also slackens. Occasionally in this month the light-vessel swings. In 1868, however, she did not swing until April, while in 1869 she swung in February. At the end of the month land and sea breezes begin.

*“March.—*Throughout this month regular land and sea breezes prevail. The current, although generally S. S. W., is variable at times, setting from different quarters, one hour in one direction, another probably in the opposite. March is one of the finest months at the Little Bassas, the thermometer often reaching 87° in the shade. The land and

---

\* D'Après Mannevillette.

sea breezes being regular, and the current weak, the passage up or down the coast is easy in this month.

*“April.”*—The winds are variable during this month, being sometimes from the N. E., at others from the S. W., blowing from the latter quarter for days together. Sometimes in the course of a day the light-vessel's head will be at almost every point of the compass. Weather becomes gloomy, with occasional showers; thunder and lightning are prevalent, with dense blackness over the land. As a rule, very little current is felt, but it occasionally runs strong to the S. S. W.

*“May.”*—Between the 1st and 20th of this month the S. W. monsoon set in strong and steadily, generally much rain falls, and thunder and lightning are common. During seven years the S. W. monsoon set in regularly from the 4th to the 10th of May; in 1869 it was steady at S. W. from April 6th; this year is, accordingly, an exception to the rule, with regard to winds and currents. After May no rain falls until the 20th of October; and it is hardly an exaggeration to say that not a drop of rain falls during the S. W. monsoon. The current runs N. E. from one to three knots.

*“June, July, August, and September.”*—Throughout these four months one day resembles another, the S. W. monsoon blowing strong and steadily, generally beginning about 10 a. m., by noon increasing to a gale, so continuing until 4 p. m., then decreasing toward sunset; if the gale continues after sunset it moderates after 10 p. m., never attaining throughout the night aught beyond a strong breeze. There is a strong current setting N. N. E. from one to three knots. As soon as the sun passes southward of the line, the regular monsoon ceases on the south coast of Ceylon, the wind becomes variable, land and sea breezes setting in, with an intervening calm.

“A remarkable circumstance occurs with regard to current during the S. W. monsoon. After running three knots to the N. E. for ten days, suddenly it slackens, and runs from two to three and a half knots S. W., or from the Bay of Bengal, lasting sometimes only one day, at other times for a week; these changes happen at all times of the moon, and appear to obey no recognized law. By observing these changes in the current, monthly communication

was, with extreme difficulty and much risk, kept up with Potana Bay, and thence by land with Galle.

*“October.*—During this month regular land and sea breezes prevail, the S. S. W. current runs strong toward the end of the month, at times attaining a rate of five knots. The light-vessel does not swing again until the middle of March, so that for five months and a half the current runs steadily out of the Bay of Bengal, with a velocity of from one to three and a half knots, and sometimes of five knots. In communicating with the shore on the 15th December, the light-vessel's boat was swept past Potana, and could neither return to the ship nor land; but at length, when out of food and water, the coast was reached at Kirinde, where the boat remained until February 15th, before a return to the light-vessel could be attempted.

*“November,* although rainy, with thunder and lightning, is not a bad month at the Little Bassas. The N. E. monsoon, blowing strong and steadily, sets in toward the end. The S. S. W. current runs strong, invariably setting floating substances out to sea, accounting for the fact of so few things coming on shore on the south coast of Ceylon.

*“December.*—During this month a strong N. E. monsoon prevails, and the current attains its greatest strength. The light-vessel is uneasy and rolls violently. In December no ship should proceed to the northward along the southeast coast of Ceylon. The period during which ships may proceed north is that intervening between February 15th and November 15th; for three months in the year it should not be attempted.

*“Summary.*—There are no regular tides, but the currents from the middle of November, or during the N. E. monsoon, set S. S. W. out of the Bay of Bengal for five months without variation; thus a steamer steering N. N. E. has not only to oppose a three-knot current, but also has the wind dead against her; some steamers make barely two miles an hour when bound to the northward. During the remaining seven months the currents are nearly equally divided; for, about twice a month in the S. W. monsoon, the current will suddenly change from N. N. E. to S. S. W. When the sun passes northward of the light-vessel, there is no more N. E. monsoon. During the S. W. monsoon, in the event of a vessel making Dondra Head, when bound to

Galle, which is not uncommon, the master should never attempt to beat to Galle, but recross the line."

In the Gulf of Bengal the currents depend entirely on the monsoons; during that of N. E. they run to the S. and S. W., and to the N. during the S. W. monsoon. Gulf of Bengal.

In the month of April the general movement of the waters toward the N. and N. E. commences over the whole gulf, and continues until the first or middle of October. In April and May the currents attain their greatest strength,\* their velocity varying from ten to twenty miles per day. In March and April, in the middle of the gulf, the current is weak and variable; between the coast of Coromandel and the Nicobar Islands, as at the entrance of the Malacca Strait, it runs often to the S. W. In the northern part of the gulf, in the Bay of Bengal, in March, the current runs to the S., and in April most frequently to the N. Nevertheless, during the S. W. monsoon, in the east part of the gulf, and in the vicinity of the Strait of Malacca, the current often runs to the S., as near the coast of Malabar. S. W. monsoon.

At the distance of one hundred and twenty or one hundred and fifty miles from the coasts, in the middle of the Gulf of Bengal, the current to the S. W. commences regularly about the middle of October or first of November, when the N. E. monsoon has acquired some force. Before this period it is variable, and found running to the S. S. W., and even to N. W., or between these two directions. N. E. monsoon.

In January this current loses its strength, and in February it ceases entirely in the middle of the gulf and on the coasts, where, if it exists, it runs to the N. and N. W.

On the Coromandel coast, as upon those of Golconda and Orixá, the current commences to run to the N. at the end of January or during the first days of February; its velocity increases in April and May, during which months the wind blows from the S. with great regularity. After May the currents diminish and, according to the monsoon, cease in August or September. Sometimes they are found to the middle of October, although during all this month they are generally directed to the S. † West coast of the Gulf of Bengal.  
S. W. monsoon.

The direction of the northerly current along the Coro-

\* D'Après de Mannevillette, to whom are due the greater part of the following remarks on the currents of the Gulf of Bengal, reproduced later in different sailing directions.

† Philo-Nauticus and D'Après de Mannevillette.

mandel coast and all the east coast of Hindostan, from Ceylon to Balassore, varies between N. and N. E., and sometimes it turns as far as E. N. E. In August the current from the Ganges is found strong and extends as far as the Coromandel coast; from its direction it contributes to modify and weaken the current setting toward the N.\* During the S. W. monsoon the velocity of the current varies from one to one and a half milè per hour.

**N. E. monsoon.** Toward the end of October the currents commence to run to the S. along the east coast of Hindostan; in November and December they run toward the S. S. W. at the rate of one mile per hour; from the beginning of December to January they are subject to the influence of the winds and have a velocity of from two to two and a half miles per hour, setting to the S.; they are more rapid near the coast than at large. Sometimes in March they are reversed and take a northerly direction, though most frequently they still run to the S. during this month.

East coast of  
the Gulf of Ben-  
gal.

On the coast which bounds the Gulf of Bengal on the east, and in the vicinity of the Strait of Malacca, during the S. W. monsoon, the current sometimes runs to the S., as already mentioned.

During the N. E. monsoon in the vicinity of the Nicobar Islands, as well as between these islands and Junkseylon, there is generally a strong current setting to N. W. and sometimes to N. On the coast between Cape Negrais and the Bay of Chittagong, during both monsoons, there are rarely any rapid currents, and often there are only the tides. However, from the middle of September to May there is sometimes a current setting to the S., which from June to September runs to the N. In December, particularly in the bight of the Bay of Bengal, there are no other currents than those of the tides, which prevail during the greater part of the year. From September to November, however, there is often, on the coast of Bengal, a current varying from W. N. W. to W. S. W.

Island of Suma-  
tra.  
West coast.

The length of the west coast of Sumatra the currents are generally weak, their velocity not exceeding one-half to three-quarters of a mile per hour. Some authors say that they follow the monsoons, running to the S. E. from October to May, and to N. W. from May to October.† Forrest, however, states that, during the S. W. monsoon, the mass of

\* The time of the swelling of this river.

† Philo-Nauticus.

water driven toward the west coast of Sumatra is divided, on arriving at Cape Acheen, into two branches, the one running to the N. E., the other to the S. E., along the coast. Generally it is observed that on this coast of the island the currents seldom set to the N., being most frequently directed to the S. E.

After August, near Acheen, and along the southwest coast of Sumatra, as on the south coast of Java, the currents run strong to the E. After December, at Acheen, the currents flow out from the Strait of Malacca, running to the W., while near the southwest coast of Sumatra they set to the S.

The currents are very rapid in the narrow channels between the Islands of Sunda. Generally they follow the direction of the prevailing winds, and are greatly influenced by the tides. Consequently nothing precise can be said regarding them. In the Strait of Sunda, however, it has been observed that from January to April they set to the E., and to the W. during the remainder of the year; they attain a velocity of three and a half miles per hour. In that portion of the sea between these islands and New Holland, the currents set to the E. from November to April, during the N. W. monsoon, and during the S. E. monsoon, from April to November, they run to the W. It does not enter into the plan of this work to give all the observations collected on the currents in the narrow seas, called *seas of passages*, or on the channels by which they are connected, more particularly as no general law can be deduced from them; for these observations we refer to the works which treat especially of this navigation, and will terminate these remarks on the currents with those of the China Sea.

#### CHINA SEA.

During the N. E. monsoon the currents in the China Sea set generally to the S. W., their velocity depending on the force of the wind. At the commencement of the monsoon, when the winds are strong, there is an increase of the current setting to S. W., and when the breezes become moderate or light there is little or no current.\*

In the west part of the China Sea, along the coast of the Peninsula of Malacca and of Cochin-China, the current most frequently commences to set to the S. about the middle

East coast of  
the Peninsula of  
Malacca and of  
Cochin-China.

---

\* D'Après de Manneville and Horsburgh.

of October; sometimes earlier on the latter coast, and follows this direction until April. In March it constantly runs to the southward, in the vicinity of Pulo-Aor, and at this period, in this locality, there are at times calms and light winds from the E.

On the coast of Cochin-China, and near the Island of Hainan, the currents, variable from S. to S. W., commence about the middle of September, near the land, from the parallel of  $15^{\circ}$  to  $11^{\circ}$  N., they increase very rapidly; from thence they diminish as they descend to the southward.

With the N. E. monsoon, from the parallel of  $14^{\circ}$  N. to Cape Padaran, there are often, near the coast, currents running to the S., which attain a velocity of forty, fifty, and even sixty miles in twenty-four hours; this velocity is variable, and it is only in the zone mentioned that it is accidentally so considerable. Near Cape Padaran the currents diminish, as also at the entrance of the Gulf of Siam, and their direction is S. W.

South coast of  
China.

Near the south coast of China, at the same period, the current most frequently sets toward W. S. W., and follows the coast nearly parallel to it. It has a considerable velocity after gusts of wind or typhoons. At about seventy-five miles from the land it is less strong in deep soundings than upon banks and between islands. Sometimes near the land the currents to the W. are replaced by the tides.

Channel and  
Strait of Formosa

Between the Islands of Formosa and China the current sets to the S. during the N. E. monsoon, and when the wind from N. E. is strong they take a direction of from S. W. to S.; in the strait between the southern extremity of Formosa and the north point of Luzon, when the breezes are light and variable, the current runs quite often to the N.

West coast of  
Luzon.  
Coast of Pala-  
wan.

On the west coast of Luzon they are very variable, but directed rather to the S. than to the N.; the same is observed on the coast of Palawan, where they depend entirely on the winds, and have no force, except from storms.

S. W. monsoon.

In the middle of the China Sea the currents commence to set to the N. about the first part of May, and sometimes by the middle of April. When the S. W. monsoon is strong they preserve their direction to the N. and N. E. until September. They are, nevertheless, during this monsoon, very irregular. When the winds are light, or even moderate, they take different directions. After the strength of the monsoon at large there is little or no N. E. current, and sometimes it sets to the S.

AN.



ha-

of

son

ds.

as-



C

S

L

W

Along the coast of Cambodia, from Pulo-Oby to Cape Padaran, the currents generally set to the N. E., parallel to the coast, from April to October. At the same period, near the east coast of the Malay Peninsula, from the Strait of Singapore to the Gulf of Siam, they set to the N. W. Gulf of Siam.

Near the coast of Cochin-China, to the north of Cape Padaran, the currents are weak during the S. W. monsoon, and when they are felt between this cape and the Gulf of Tonquin they are found setting alternately toward the N. and the S. Coast of Cochin-China.

When the gusts of wind from N. W. and W. blow over the Gulf of Tonquin, and at large, the currents, in the vicinity of the Paracels and in the sea where they are felt, set generally to S. W. and S.; their direction, in this case, being oblique, or nearly opposed to the direction of the wind, causes an ugly sea.

On the south coast of China the wind has a great influence upon the currents. During the strong breezes from the S. W. it sets to the E., parallel to the coast; it is usually weak near the islands to the west of Macao, and between these islands there is generally a current setting to the W., occasioned by the waters from the Canton River. Its force between Macao and the Island of St. John is about one to two miles per hour, and its direction varies between W. S. W. and W. N. W. This current does not prevail during the S. W. monsoon; it diminishes sometimes, when weak tidal currents are felt setting to the E. South coast of China.

On the coasts of Luzon and Palawan the currents set to the N. during all the S. W. monsoon; these currents are often null, and it is seldom that they have any strength near the coast. Coasts of Luzon and Palawan.

When the winds are strong from W., in the localities of the Bashee Islands, the current sets to the E.; most generally, however, it runs strong to the N., varying at times from N. N. W. to N. E.\* Bashee Islands.

In the seas of passages the currents are much stronger in the N. W. than in the S. E. monsoon; for this reason the Strait of Sunda is much more easily traversed in coming from Europe or the Indian Ocean in May, June, July, and August, than in leaving during December, January, and February. Beside, in these seas the currents depend greatly on the winds, although these are very variable. Seas of passages.

---

\* D'Après de Manneville, Romme, &c.

## CHAPTER III.

### NAVIGATION OF THE INDIAN OCEAN.

In no sea has the science of navigation made so remarkable progress as in the Indian Ocean, and in no other has it conduced to so important and decisive results. The seaman at present not only knows the regions of this sea where, according to the season, will be found the periodical winds and favorable currents, but he also knows how to make use of them by calculating his voyages in accordance with the seasons. This knowledge, so useful to navigation generally, is particularly important to vessels depending wholly on their sails.

In the *General Examination of the Atlantic Ocean* we have pointed out the routes to the Cape of Good Hope: We will now speak of those from this point to the ports of the Indian Ocean and China Sea. These directions are taken principally from D'Après de Manneville and Horsburgh.

At the Cape of Good Hope, the seaman having the choice of several routes to the different localities of the Indian Ocean, he will be guided by the season of the year and the prevailing monsoon. To render these researches easy, we have adopted the following divisions, and have classed the routes as below. In the first division we give the great routes:

No. 1. *The Interior, or Mozambique route*; and, No. 2. *Route to the east of Madagascar*—Is adopted during the S. W. monsoon, when sure of reaching the port of destination before the end of the monsoon; they lead to the Red Sea, Gulf of Persia, India, and the Strait of Malacca.

No. 3. *Boscauwen route*—Is adopted when going to the west coast of India, when the season is so advanced that there is a probability of not arriving before the N. E. monsoon sets in.

No. 4. *Middle route*—Is adopted principally when the Cape of Good Hope is doubled between the 1st of September and 1st October. It leads to the west coast of India.

No. 5. *First outer route*—Is adopted in going to the Gulf

of Bengal, with a certainty of arriving before the end of the S. W. monsoon.

No. 6. *Second outer route*—Is adopted when there is no certainty of arriving in the Gulf of Bengal before the end of the S. W., or until the N. E. monsoon.

No. 7. *Direct route to the Strait of Sunda*—Is adopted in the S. W. monsoon, when sure of arriving at the port of destination before the end of this monsoon.

No. 8. *Eastern route*—Is adopted when the meridian of the Island of St. Paul or Amsterdam is left, between the middle of September and October; that is, when the port of destination will be reached with the N. E. monsoon. It leads to the eastern straits, Bally, Lombock, Alass, Sapy, Ombay, &c.

By these eight routes the Indian Ocean may be traversed under all circumstances when departing from the Cape of Good Hope. We have numbered them in order to refer to them more readily hereafter.

The same division comprises the return routes from the Indian Ocean to the Cape of Good Hope, corresponding to these eight principal routes, which we designate the *great routes*. In the second division will be found the special navigation of the Gulf of Arabia, or Oman. In the third, the special navigation of the Gulf of Bengal; and in the fourth, the routes to the China Sea, with the return route, the navigation of the seas of passages, and some routes from the ports of Australia to China and India.

#### FIRST DIVISION.

The route by the Mozambique Channel, or the interior passage,\* is the most direct during the S. W. monsoon, from April to November, when bound to Bombay, Mahe, Ceylon, and the Gulf of Bengal. But it should only be adopted when, on starting from the Cape of Good Hope, there is a certainty of arriving on the coast of India with the S. W. monsoon.

No. 1. Interior,  
or Mozambique  
route.

Running for the Mozambique Channel, the currents setting to the S. W. and W. should be guarded against. These are still felt after doubling the Agulhas Bank, and for this reason a vessel should not be kept to the northward too soon, especially if it is desired to make the east coast of

\* The greater part of these directions are from D'Après de Mannevillette.

Madagascar to the south of the Bay of St. Augustine. In this case it will generally be well to reach the meridian of  $37^{\circ}$  E. before crossing the parallel of  $34^{\circ}$  or  $35^{\circ}$  S. latitude, when run directly toward the channel.

The route can either be made along the east coast of Madagascar, or in the middle of the channel. In the first case there are some dangers near the coast to be avoided. In the second, which appears preferable, Europa Island and the Bassas da India are to be avoided. In passing, during the night, the parallels on which these dangers are situated, they can be passed either to the east or west, and when to the northward of them, run directly for the Islands of Mohilla and Comoro, to the westward of Juan de Nova. This is also the route to the Island of Mayotta.\* With good breezes from S. or S. S. W. it is better, says Horsburgh, to pass to the westward of Europa Island and the Bassas da India, as this side of the channel is more clear than the other. On approaching the coast of Africa the breezes are generally light, with the current setting to the S., and the monsoon is generally better established in the middle of the channel than upon its borders. In April, and in the beginning of May, however, the best winds are found to the west of the meridian of Comoro, a little to the west of the middle of the channel. From Comoro, going to the ports of the coast of India, cut the line in  $54^{\circ}$  E. longitude, and when to the northward of it, shape a course to make the land, according to the following directions:

Surat or Bombay.

If going to Surat or Bombay, the route from the Equator is direct; only for the first port the parallel of the high land of St. John should be taken well to the westward, and that of the Island of Kundary for the second port, when steer directly for the port.

Goa.

Ships bound to Goa should make the Burnt Islands.

Condapoor, Tellichery, Mahe, Calicut.

If bound for ports situated to the southward, on the west coast of India, the Channel of Eight Degrees, or that of Nine Degrees, will generally be taken. However, when the port of destination is Condapoor, Tellichery, Mahe, or Calicut, the route can be shortened by passing to the northward of the Laccadives, making the Pigeon Islands, and then running along the coast to the southward.

Cochin, Quilon, Anjenga.

Going to Cochin, Quilon, or Anjenga, the route by the

---

\* D'Après de Mannevillette, 1819, p. 27, &c.

Eight or Nine Degrees Channels should be preferred. That of One and a half Degree can also be taken.\*

The Eight Degrees Channel is the one to be preferred when bound to Ceylon or the Coromandel coast. In traversing <sup>Ceylon and the Coromandel coast.</sup> it, if certain of the position, or if Minicoy has been sighted, as soon as to the eastward of this island steer directly for Point de Galle. If not sure of the position keep to the eastward until on the bank of soundings off Cape Comorin, between the parallels of  $8^{\circ}$  and  $9^{\circ}$ , and if the weather is clear, which is rarely the case in the S. W. monsoon, the land will be seen at a distance of twenty-seven or twenty-eight miles. As soon as soundings are obtained keep to the southward for the parallel of Point de Galle, to the westward of this point; for, with the S. W. winds, the current runs into the Gulf of Manar, and in the vicinity of the point the winds are often S. S. W., which would delay a ship much if obliged to work to windward to pass the point.

By route No. 1, Krusenstern, leaving the Cape June 27, 1797, crossed the line in  $46^{\circ} 50'$ ; reached Ceylon the 2d, and Madras the 4th of August, after a passage of forty days

The passage to the eastward of Madagascar is often taken, as there are less dangers than in the preceding, and variable winds are less frequent. Should two ships separate to the east of the Cape of Good Hope, one taking the interior route, the other that to the east of Madagascar, the one taking the latter route may arrive first at her port of destination. She would be most likely to do so in August and September when the winds are variable in the Mozambique Channel. <sup>No. 2. Route to the east of Madagascar.</sup>

The route east of Madagascar can be adopted from February to October. It will, however, be necessary to double the Cape of Good Hope, so as to be sure of reaching the port of destination in India with the S. W. monsoon. In making this route, after doubling the Cape of Good Hope, run to the eastward, and do not pass the polar limit of the trade-winds before reaching the meridian of  $52^{\circ}$  E.

If the trades are taken sooner, a difficulty may be experienced in getting to the east, particularly on the parallel of the southeast part of Madagascar, where the winds known as the Fort Dauphin blow strong from N. N. E., causing a rapid current of forty and even fifty miles, run-

---

\* D'Après de Mannevillette.

ning to the southward in the vicinity of the land. These winds extend several degrees to the eastward of Madagascar.

In traversing the zone of the S. E. trade-winds keep between the meridians of  $51^{\circ}$  and  $52^{\circ}$  to the parallel of  $15^{\circ}$  S. latitude, making the east Cape of Madagascar, the land to the northward of this cape, or Cape Amber; from thence taking a new departure. Leaving Cape Amber, the best course is between N. and N. by E. until the islands situated to the northeast and northwest of the cape are passed. Then, with the S. W. monsoon, any port in India can be readily reached.

Horsburgh left the British Channel the 30th of April, 1802, and anchored in the road of Bombay the 30th of July, making the passage in three months.

Route from the  
Cape of Good  
Hope to the Red  
Sea or the Per-  
sian Gulf.

In leaving the Cape of Good Hope for the Red Sea or the Gulf of Persia, from September to March, it is advantageous to adopt the route No. 2, to the east of Madagascar. From March to September the route No. 1, the interior passage, should be taken; though even at this season the passage may be made to the east of Madagascar, though the other will in all probability, be the shorter. After passing the Seychelles by the eastern route, steer directly for the Red Sea or Persian Gulf.

No. 3. Bosca-  
wen route.

The Boscawen route was called after the admiral of that name, who adopted it when escorting to India a fleet of twenty-six vessels, and made a very short passage.

On this route the admiral passed to the south of Madagascar between the parallels of  $37^{\circ}$  and  $38^{\circ}$  S. latitude, and in the traverse current of the Indian Ocean, until in  $54^{\circ}$  to  $55^{\circ}$  E. longitude. He then steered to the north to pass between Réunion and Mauritius. From these islands he ran directly north, leaving to the eastward the Cargados, Garajos, and the Saya de Malha Bank; and to the westward the Seychelles, and crossed the line on the meridian of  $62^{\circ}$ .

The Boscawen route is particularly adopted when, in going to Bombay or the coast of Malabar, the season is found to be so advanced as to render the arrival doubtful before the commencement of the N. E. monsoon.

If the Cape of Good Hope is not doubled before the 1st of September, this and the middle route, of which we will speak hereafter, are more advantageous than the two preceding. In fact, these two routes going much further to

the eastward, place a vessel in a much better position to reach the port of destination, if surprised by the commencement of the N. E. monsoon.

The middle route is still more to the east than the Bos-  
cawen, and leads outside and to the east of the Archipelago  
of Madagascar, then to the west of the Chagos Islands. To  
make this route on leaving the Cape of Good Hope, steer  
to the east as far as the meridian of  $67^{\circ}$  or  $68^{\circ}$  E. longitude,  
so as not to be thwarted by the general winds, should they  
haul much to the E., which does not usually happen ex-  
cept in March and April.

No. 4. Middle  
route.

From thence, running to the northward, cross the paral-  
lels of  $27^{\circ}$  or  $26^{\circ}$  S.; arriving in the trade-winds, keep to  
the north, on the meridians of  $67^{\circ}$  or  $68^{\circ}$  as long as the  
winds permit.

In the vicinity of the Equator, the wind is often found  
from W. and N. W., which must be taken advantage of to  
get to the northward. The other side of the Equator the  
N. E. monsoon may not be unfavorable, as it blows, at this  
period, oftener from N. W. than from N. E. If they are not  
too strong they will be favorable for ships bound to the  
coast of Malabar.

On leaving the general winds, in making to the north,  
strive to keep between the meridians of  $65^{\circ}$  and  $68^{\circ}$ , so as  
not to be set on the Maldives by the current running to the  
east, and the light breezes encountered in the vicinity of  
the line. In October and November, when in  $3^{\circ}$  or  $4^{\circ}$  N.  
latitude, winds will probably be found from the N. in-  
clining rather to the W. than to the E., as has been  
already stated; advantage should be taken of these varia-  
tions, and the most favorable tack taken; as the sea is gen-  
erally smooth, with good judgment as to the tacks, it will  
be easy to pass to the northward of the Maldives; when  
run on the tack to the northeast until the land is made. If,  
instead of going to the northward on the west coast of  
India, the port of destination is to the southward on this  
coast, the Eight or Nine Degrees Channels can be taken; or  
if going to Ceylon, the One and a half Degree Channel.\*

The middle passage is adapted particularly to vessels  
doubling the Cape of Good Hope between the 1st of Sep-  
tember and the 1st of October and bound to the west coast  
of India.

---

\* D'Après de Manneville, Horsburgh.



Routes to Réunion and Mauritius.

In going from the Cape of Good Hope to Réunion or Mauritius, a course should be taken to the eastward, keeping in a high latitude, according to the instructions given for the Boscawen and middle routes, running more or less to the eastward, according to the season.

The trade-winds should be entered on the meridian of the island of destination, or a little to the eastward of this meridian, so as not to be forced by easterly winds to run too close to the wind to make a direct course.

When the sun has great northern declination, it is not necessary for a good sailing ship to stand as far to the eastward, in the high latitudes as above, for then the trade-winds blow between E. S. E. and S. E., and it is the period when they vary the least towards the E. In March and April, on the contrary, they often take this direction, and from November to March it is observed that they are oftener to the N. of E. than at E. even, and often vary from N. E. to N. W.

Routes from Réunion and Mauritius to the ports of India.  
S. W. monsoon.

When leaving Réunion or Mauritius for India, from March to September, keep to the north and pass either to the east or west of the Cargados-Garajos, and to the east of the Seychelles; then, if bound to the west coast of India with the S. W. monsoon, after crossing the line, adopt one of the routes already mentioned, according to the port of destination. If going to the Gulf of Bengal, after passing the Seychelles, take the equatorial channel or that of One and a half Degree, for the Island of Ceylon.\*

Leaving Mauritius or Réunion for India, and particularly for the Gulf of Bengal, it will be always advantageous, if the winds permit, to pass to the east of the Cargados-Garajos, and even the Chagos.

N. E. monsoon.  
First route.

During the N. E. monsoon, on leaving these islands bound to the Gulf of Bengal, Horsburgh advises the same route as in the S. W. monsoon, and considers that a vessel should stand sufficiently to the eastward to take the equatorial channel or the One and a half Degree Channel, this route being more direct than the others.

Second route.

D'Après de Mannevillette, on the contrary, gives as the preferable route that made by himself, which he calls the equatorial route. He states that ships following this route have been but twenty-six to thirty days in going from Mauritius to Pondichery. Leaving Réunion or Mauritius

---

\* D'Après de Mannevillette.

in November, December, January, or February, and even at the beginning of March, keep to the north, or follow the Boscawen route as far as the parallel of  $5^{\circ}$  S., then make to the east, keeping, according to D'Après, between the parallels of  $4^{\circ} 30'$  and  $3^{\circ}$  S. latitude; according to Horsburgh, between  $3^{\circ}$  and  $1^{\circ}$  S. The former says\* that to the north of  $2^{\circ}$  S. there are frequent calms and squalls, while between  $3^{\circ}$  and  $4^{\circ}$  there are light variable breezes, blowing frequently from the westward. If bound for the Gulf of Bengal, after reaching the meridian of  $92^{\circ}$  or  $94^{\circ}$  E., run north to cross the line and then steer for the port of destination. In going to a port of the west of India, it will not be necessary to go so far to the eastward, it will then be sufficient to reach  $83^{\circ}$  or  $84^{\circ}$  E. longitude.

The four routes of which we have spoken can be followed not only in going to the west coast of India, but also when bound to the Gulf of Bengal. But it is necessary to double the Cape of Good Hope, so as to arrive at the port of destination before the ending of the S. W. monsoon.

Under the same circumstances a more direct route can be taken when bound to the Gulf of Bengal, and from March to October the following may be adopted, which is the first outer route:

No. 5. First  
outer route.

From the Cape of Good Hope run nearly on the parallel of  $38^{\circ}$  or  $39^{\circ}$  S. latitude as far as the meridian of  $62^{\circ}$  E.; from thence run about N. N. E., crossing the polar limit of the trade-wind, (the parallel of  $28^{\circ}$  or  $29^{\circ}$ ), about the meridian of  $82^{\circ}$  or  $83^{\circ}$ ; then steer to the northward, increasing as much as possible the longitude while in the trades, to guard against their variations, they coming frequently from the east in March, April, and May, as also to counter-balance the current, setting to the west in this zone. When in  $1^{\circ}$  or  $2^{\circ}$  S. latitude, between April and October, there is a certainty of reaching any of the ports of the Gulf of Bengal with the S. W. monsoon.

Vessels bound to Ceylon, Pondichery, or Madras should make to the north in the trade-winds, and keep a little to the west of Point de Galle, if desirous to make it. If bound to Trincomalee at this season, the land should be made to the southward of the port. Those going to Pondichery or Madras would do well also, from March to September, to make the land to the southward of these ports, on account

\* D'Après de Mannevillette, *Instructions*, pp. 79 and 80.

of the currents which set to the N. during the S. W. monsoon.\*

No. 6. Second  
outer route.

Going to the Gulf of Bengal, if, after passing the Cape of Good Hope, it appears that the line cannot be crossed between October and April, and that the gulf cannot be reached until after the commencement of the N. E. monsoon, or at the period of its greater strength, the following route should be adopted, called the second outer route :

From the Cape of Good Hope run sufficiently to the east to be able to cross the polar limit of the trade-winds on the meridian of  $84^{\circ}$  or  $85^{\circ}$  E.; keep then to the north, increasing the longitude, to make sufficiently to the eastward to counterbalance the effect of the current, until approaching Cape Acheen, the northern point of Sumatra. It is not desirable, however, to make sufficiently to the eastward to sight the cape or the islands along the west coast of Sumatra, for at this season in their vicinity, particularly in October and November, there are light, variable breezes with squalls from the N. W. or W., and the current sets toward the Strait of Malacca. If bound to this strait, however, it would be the best route to pursue.

Having passed one hundred and fifty or one hundred and eighty miles to the west of Cape Acheen, if the wind permits, sight the west coast of the Nicobar Islands. When the winds incline to the E. keep as near as possible, and if it varies to E. N. E. or N. E. pass to the westward of them, close to the wind. On the parallels of  $16^{\circ}$  or  $17^{\circ}$  the wind frequently comes from the N., and advantage should be taken of it to tack to the eastward, so as not to be drawn toward the west coast of the gulf; the coast of Aracan, however, should not be too closely approached, and in general it is in the north part of the Bay of Bengal, clear of the coasts, that a vessel should work to windward, if such is necessary; thus will be reached the soundings off Bengal and Calcutta. If bound to Pondichery, Madras, or any other port of the west coast of the gulf, it will not be necessary to approach Cape Acheen as near as above directed, and the meridian of  $87^{\circ}$  E. would be sufficient. In fact, during October and in the commencement of November, in the vicinity of the cape, the winds are frequently from N. W. or W., while during the same months in the middle of the gulf the winds are variable from S. to W.†

\* D'Après de Mannevillette, Horsburgh.

† D'Après de Mannevillette.

After the month of September the land should be made a little to the north of the port of destination, to counteract the effect of the current running to the S.; that, however, depends on the period of the change of the monsoons, which are far from being regular, and which vary sometimes a month; at times the monsoon being in advance, at others in retard.

It has been long recognized in the route just mentioned that it is not necessary to pass to the eastward of the Nicobar and Andaman Islands; this route, on the contrary, would be unfavorable, on account of the light breezes and southerly currents in their vicinity during the N. E. monsoon. Vessels leaving the Strait of Malacca for the ports of the west coast of the Gulf of Bengal, Pondichery, or Calcutta, do not follow the east coast, but take the channel between the Andaman Islands, passing to the north of the Great Andaman and to south of the Little Andaman, and sometimes even to south of the Nicobar Islands.

Bound to the Strait of Sunda, without stopping at the Cape of Good Hope, the best route to take is that which enters the Indian Ocean between the parallels of  $37^{\circ}$  or  $38^{\circ}$  S., thus avoiding the unfavorable current of the Agulhas Bank and profiting by the traverse current of the Indian Ocean.

No. 7. Direct  
route to the Strait  
of Sunda.

From the meridian of the Cape of Good Hope steer between the parallels of  $36^{\circ}$  and  $40^{\circ}$  to make the Islands of Amsterdam and St. Paul. Many, however, prefer the route between  $36^{\circ}$  and  $37^{\circ}$ , or on the last parallel; the winds, they say, are fresher and more steady than in higher latitude.

Leaving the meridian of the Islands of Amsterdam or St. Paul, a course should be made to cross the meridian of  $80^{\circ}$  E., in the latitude of  $38^{\circ}$  S., and that of  $90^{\circ}$  E. in latitude  $33^{\circ}$ , then steer to cross the tropic of Capricorn in longitude about  $102^{\circ}$  E. In making this route to the east, on leaving St. Paul, if the winds are contrary, more northing should not be made than to the parallel of  $30^{\circ}$  S., because in a lower latitude the winds are often found from E. and N. E.; it will be more advantageous to run to the south, to take again the westerly winds, about the parallel of  $38^{\circ}$ .\*

From March to September, especially in March, in April, and in May, the meridian of Java Head should be reached

From March to  
September.

\* D'Après de Manneville.

as soon as possible and then run to the north, as the trade-winds haul often to the E., and the currents setting to the W. are quite strong near the south coast of Java. It is then important to make the land to the east of the Strait of Sunda, at this season, as also to the eastward of Bencoolen, if bound to that port.

From May to the commencement of July ships going to Bencoolen need not sight Java Head, as at this period the routes are shorter steering direct for the Island of Engaño, then to Bencoolen, which the winds allow, as in this month they often vary to N. W., and then the current sets to the S. E.

From September to March.

From September to March, between the Equator and the northern limit of the trade-winds, the N. W. monsoon is found; this monsoon causes currents to the E., and often extends as far as  $14^{\circ}$  S. latitude.\* At this period, in going to the Strait of Sunda, a north course should not be made when on the meridian of Java Head; but steer for the southwest extremity of Sumatra or the Island of Engaño, and pass well to the west of the cape; when on the parallel of the Strait of Sunda steer past it, making allowance for the current setting to the S., which is usual at this season. It is principally from November to the first part of February that it is important to follow these instructions. At the same period, in going to Bencoolen, on leaving the S. E. trades, keep on the meridian of Cape Acheen until well north of the Keeling or Cocos Islands, or until on the parallel of Java Head; the winds will then probably be from the N. W., favorable to reach the Island of Trieste; in case the winds have a tendency to haul to the N. pass to the northward of this island and to the south of the Island of Larga; but should they haul to the S. W. or S., steer straight for Bencoolen, passing to the south of the Island of Trieste.†

We will complete the preceding instructions by making some remarks on the Strait of Sunda, which may be useful in traversing the strait to enter the Java Sea. The Strait of Sunda is divided into many channels by the islands; the southern one, called the Prince's Island Channel, was formerly the most frequented; but with a good, steady breeze that of Krakatoa, between the island of that name and Prince's Island, or that between Krakatoa and Pulo-Bessy, is generally preferred.

\* D'Après de Mannevillette.

† D'Après de Mannevillette, Horsburgh.

In entering Prince's Channel during the N. W. monsoon, keep near to this island and the Carpenter Rocks; during the S. E. monsoon it will be preferable, especially with a steady wind, to approach Java and the Friars when in the channel; abreast of Second Point steer for Fourth Point, passing a suitable distance from it. When abreast of Anjer steer to pass outside the Cap and inside the Button, at a convenient distance from either, giving the Brouwer's Bank a good berth. After passing this bank and the Button, if bound to Banca Strait, run for the Two Brothers. If bound to Bantam Bay or Batavia pass two or three miles from St. Nicholas Point.

In taking the Krakatoa (or Great Channel) keep a good distance to the north of Prince's Island, and steer for Fourth Point, as before directed.

The Channel of Pulo-Bessy (or Beeze Channel) is sometimes preferred to the Krakatoa Channel on account of the anchorage, and particularly when it is necessary to beat out against the W. monsoon. The Hindoostan Rock is the only danger known in the passage.

Returning from China with the N. W. monsoon by the Strait of Banca, the channel between Middle Island, or Thwart-the-Way, and Sumatra is often adopted; this channel is one of the most direct.

When the wind is fresh the northern channel can be taken, as it is quickly cleared with the assistance of the current setting to the W. It should not be taken, however, except with a steady breeze.\*

The eastern route, to reach the straits to the east, is adopted toward the end of the season; that is, when the meridian of St. Paul or of Amsterdam is passed from the middle of September to February.

The general route is as follows: First make the route as directed for No. 7, to sight the islands of St. Paul and Amsterdam; from their meridian run to the east, to cross the meridian of  $111^{\circ}$  E., in the latitude of  $30^{\circ}$  S.; run then to the north along the west coast of Australia, approaching by degrees the coast, until on the parallel of Northwest Cape. Many make the cape, but this is not necessary; but it should be passed at a distance, which must be determined by the prevailing winds, the season, and the strait to be taken.

\* For the navigation of the Strait of Sunda see special sailing directions.

The winds from S. W. and S. prevail on the west coast of Australia, from Cape Leeuwin as far as Northwest Cape. From April to November the S. E. or E. monsoon prevails near the south coast of the Islands of Sunda, and at this period these winds should be between these islands and the north coast of Australia. But from November to March, when the N. W. or W. monsoon prevails near these islands, the winds will be found variable, though inclining to the west. The currents follow the monsoons. Then, on leaving the parallel of Northwest Cape, steer a little to the westward of the strait it is desired to reach, with the N. W. monsoon; with the opposite monsoon, on the contrary, steer a little to the east.

When the winds may be expected from the west in going to the Straits of Bally, Lombok, or Allass, Northwest Cape being passed at a suitable distance, a direct course should be made to the strait to be taken. If the S. E. winds are lost between the parallels of  $18^{\circ}$  and  $14^{\circ}$  S., and westerly winds are met with, it is necessary to guard against falling to leeward of the strait to be taken, for the winds are often from W. N. W., and even N. W., near the coast of the Islands of Sunda, from the Cape of Java to the Island of Timor.

We will finish, with a few remarks, the general observations on going to the straits situated to the east of Java, when it is necessary to cross them to enter the seas of passages and reach China by the eastern route.

Straits of Lom-  
bock.

The Strait of Lombok is readily known by the large Island of Banditti, which divides its southern entrance into two nearly equal parts. The channel to the east of this island is generally taken, but there is a passage to the westward. The west point of Banditti should, however, be avoided, and a good distance kept from the island when the wind is light.

On entering the Strait of Lombok keep in mid-channel, between Lombok and Banditti, and then nearer to the east than to the west shore. The currents in this strait are rapid and no bottom.

Allass Strait.

On entering Allass Strait, which is clear and much frequented, keep nearer to Lombok than to Sumbawa, as there are soundings near the southeast point of the former, while the shore of the latter is very steep.

Sapy Strait.

The Strait of Sapy is also much frequented, however,

when going to the Strait of Salayer. During the N. W. monsoon it should not be taken; in this case the Strait of Allas is to be preferred.

Going to the Strait of Sapy, with light or variable winds from the E., the west extremity of Sandalwood should be sighted; with winds from the W., which are in general strong, approach the south coast of Sumbawa. When in the channel the Java Sea can be entered by the passage either to the east or west of the Island of Gilibanta.

The Straits of Flores, Aloo, and Panthar, situated between Ombay and the Island of Flores, are in general but little frequented; they are narrow, and the currents strong. The Strait of Ombay, or those to the west of Flores, should be preferred to them.

When in the vicinity of the northwest coast of New Holland, going to the seas of passages to enter the Pacific Ocean, the strait which should be preferred is that of Ombay. For that, make the east point of Sandalwood, and pass between this island and that of Savu, or between Savu and Rotti, if thwarted by winds from N. W. or W. It is, besides, more advantageous, particularly when the breezes are moderate, to pass to the east rather than to the west of Sandalwood, and through the channel which it forms with Flores. In the case when the currents are setting strong to the E., with the N. W. monsoon, the route west of Sandalwood should be taken.\*

#### ROUTES—RETURNING.

On leaving the Red Sea, Gulf of Persia, or ports of the west coast of India, during the strength of the N. E. monsoon, to double the Cape of Good Hope, route No. 1 can be taken, (the interior route by the Mozambique Channel.) In this monsoon it is the direct route when leaving the Red Sea or the Persian Gulf; but when leaving the ports of the west coast of India it should not be adopted, except during the strength of the monsoon in December and January, the period when the winds generally prevail from N. E. throughout the Mozambique Channel, or at least very near to its southern boundary. It is important, in every case, when leaving the west coast of India, not to take this route either too early or too late in the season; that is, neither at the commencement nor at the end of a monsoon, although

\* For the navigation of these straits see the special sailing directions.



this route is the shortest for leaving the Indian Ocean; headwinds from the S. are very frequent in the channel in the months of October and November, as also in February and March. The strong current running to the S. is no doubt favorable; nevertheless, this route should not be taken when leaving India at the end of the N. E. monsoon. In January and February there are, besides, frequently strong gusts of wind in the southern part of the channel. It is for this that many prefer under all circumstances the route No. 4 (the middle route) when leaving ports situated on this coast.

Leaving the Red Sea or the Persian Gulf the route is direct; the following are the directions for the navigation near the coast of Africa, those for doubling the Cape of Good Hope will be given hereafter:

Steer to make the Island of Comoro, passing to the north of the Seychelles and the islands northwest of the Archipelago of Madagascar; from thence a course can be taken either to the west of Comoro, or through one of the channels between this island and Mayotte. If the wind is fresh from the N. keep midway in the Mozambique Channel; if, on the contrary, the winds are variable or from the southward, the coast of Africa should be kept aboard to take advantage of the favorable currents under all circumstances; pass to the west of Juan de Nova, of Europa Island, and the Bassas da India; when in sight of Cape Corrientes, should the weather permit, keep from twelve to thirty miles from the coast of Natal; but should the wind be from S. E. with a heavy sea, the offing should be made without delay.

Directions for  
doubling the Cape  
of Good Hope.

In all the routes returning from India it is desirable to make the land in the vicinity of Algoa Bay, especially should it not have been sighted further north; then keep the coast at a short distance, or, if preferred, keep on the Agulhas Bank, the edge of which should not be left. In case the land is made to the east of Cape Recif, or to the east of Algoa Bay, with fog, and having to work to the westward, it is necessary, particularly at night, to keep a lookout for Dodington Rock, situated well out from the opening of this bay.

In February, March, and at the commencement of April, after sighting the land near Algoa Bay, the S. E. winds prevailing at this period, the best route will be to follow the outer edge of the Agulhas Bank as far as the meridian of

23° or 24° E. It is necessary in order to counteract the effect of the current, which sets in this locality to W. S. W., S. W., and S. S. W., to steer a little toward the land to keep on the bank.

During the winter months, June, July, and August, the time when blows from the W. and N. W. are frequent, the coast should be kept close aboard, the sea being smoother than off the coast. D'Après de Mannevillette remarks that thirty-six miles is the greatest distance a vessel should keep off the shore and he gives this as the distance to be preferred. He adds: "As the depths on the bank are very variable and the coast steep in many places, the distance cannot, with any certainty, be estimated by the soundings, and for this reason much prudence should be observed in the navigation. On coming from sea there are frequently fogs which prevent the lower portion of the land from being seen, while the tops of the mountains are visible." \*

During the whole year, when the wind blows strong from N. E., varying by the N. to the W., it is advantageous to keep near the coast and manage so as not to be drifted to the south and carried into the traverse current of the Indian Ocean, running to the eastward as heretofore mentioned.

There is not, in general, any danger in approaching the coast of Africa, for it is very seldom that the winds blow on shore with violence, and generally a favorable tack can be made off shore.

Sometimes, to the east of the Cape of Good Hope, the weather is bad; while to the westward the cape is scarcely doubled when the weather becomes good with fresh breezes from the S.

When on the meridian of Cape Agulhas, with the wind fresh from S.W. to S. S. W., a good offing should be kept in order to double the cape on one stretch; at night this is particularly necessary. If circumstances do not permit sighting the cape or Cape Hanglip, soundings should at least be obtained on the western edge of the Agulhas Bank to be certain of being sufficiently to the west; this precaution is in a great measure indispensable for shaping the course after doubling the cape. In fact, when not sure of the longitude frequent soundings should be made, and the cape should not be doubled until the soundings are lost on the western edge of the Agulhas Bank. Should soundings

---

\* *Directions on the navigation of the East Indies*, 1819, p. 328.

be again obtained after running to the northwest, it will be necessary to steer immediately west. The western edge of the bank only extends south by east from the Cape of Good Hope. As to the southern edge, it is formed rather by many small separate banks than by a continuation of the same bank. It often happens that in  $36^{\circ}$  S. latitude, although to the east of the cape, the bottom is not obtained; thus, in this locality, the soundings are a very doubtful indication, and it is necessary to be more to the north to have confidence in them.\* Having doubled the Cape of Good Hope steer to the northwest.

No. 10. Route  
returning from  
the west coast of  
India, from Cey-  
lon or Pondichery

Vessels leaving the west coast of India, Ceylon, or Pondichery, to double the Cape of Good Hope, may follow the route just mentioned. The Island of Ceylon being, generally, the point of departure, in making this route those vessels which start from the west coast of India, in the N. E. monsoon, cannot cross the line as far to the eastward as those departing from the Gulf of Bengal, (on the meridian of  $87^{\circ}$  to  $89^{\circ}$ ;) from this it often happens that they are carried near Rodriguez by the S. E. trade-winds.

On leaving the west coast of India, keep along the coast to reach the southwest coast of Ceylon, and follow it as far as Cape Dondra. From this cape take the tack to the southeast, keeping good full with the N. E. monsoon, and try to cross the line between the meridians of  $84^{\circ}$  and  $85^{\circ}$  E. longitude.

From April to November there are seldom storms in the Indian Ocean, and at this period a vessel may pass ninety or one hundred and twenty miles to the eastward of Rodriguez. During the other months it is prudent to keep it at a distance of two hundred and ten to two hundred and forty miles.

Route from  
Mauritius or Ré-  
union to the Cape  
of Good Hope.

If stopping at the Island of Mauritius or Réunion, on leaving there, when on their meridian, to the southward of the islands, steer to pass at a distance of ninety miles from the southeast point of Madagascar; then from the parallel of  $26^{\circ} 30'$  or  $27^{\circ}$ , steer west-southwest until near the coast of Africa, which sight at Algoa Bay, or even as high as Port Natal, in order to profit by the currents which run along the coast.†

Independent of the advantage gained by a direct route,

\* D'Après de Mannevillette, *Instructions*, &c.

† D'Après de Mannevillette.

that already indicated presents that of keeping a vessel as long as possible in the region of the trade-winds, and without injury should the wind shift.\* After making the land, in doubling the Cape of Good Hope, follow the instructions given in route No. 9.

In leaving Madras or Pondichery, with the N. E. monsoon, make a course to double the Island of Ceylon, either sighting it or not, as may be desired; then run to cross the line between  $86^{\circ}$  or  $87^{\circ}$ , or even as far to the eastward as  $89^{\circ}$  E., and shape a course for Mauritius or Réunion, as may be, whether to anchor there or to pass to the southward without touching; from thence follow the route already given.

On leaving Bengal, or the Malacca Strait, for the Cape of Good Hope, steer to cross the line in  $89^{\circ}$  to  $101^{\circ}$  E. longitude. On leaving the Strait of Malacca it will be desirable to run well off to the west-southwest before keeping to the south, to avoid the light, variable breezes which prevail near the islands of the southwest coast of Sumatra. Should the winds be found variable near the Equator, the tack should be taken on which the most will be made to the southward, to reach as quickly as possible the zone of the S. E. trade-winds; when in the trades, shape a course to pass a suitable distance from Rodriguez or Réunion, if not bound to either, and fall into the routes No. 9 and No. 10.

On leaving the Straits of Sunda, or those to the eastward, for the Cape of Good Hope, it is necessary to reach as soon as possible the zone of the trade-winds, and that portion of the zone where they are strongest; then keep toward the west. The trade-winds are generally fresh in  $14^{\circ}$  to  $15^{\circ}$ , and increase in force to  $18^{\circ}$  and  $20^{\circ}$  S. latitude, and are usually strongest between the two last parallels, although in March and April they may be there often light and sometimes interrupted by westerly winds. The routes No. 9 and No. 10 can then be taken.

## SECOND DIVISION—THE GULF OF ARABIA OR OMAN.

The most favorable season to go from Bombay, or from the ports of the west coast of India to the Red Sea, is from October to April, and particularly from the 1st of February to the middle of March.† Those leaving Bombay after the

No. 11. Route returning from the Gulf of Bengal or Strait of Malacca.

No. 12. Return from the Straits of Sunda and the east to the Cape of Good Hope.

Route from Bombay, or the ports of the west coast of India, to the Red Sea.

\* D'Après de Manneville.

† The remarks on the routes not otherwise mentioned are taken from Horsburgh.

month of April should take the southern route, of which we will speak hereafter, and run to the west on approaching the Equator. Fresh winds from the S. are met at this period, near the east coast of Africa, in the localities from Cape Orfui or Ras-Hafoon, if the land there is made during the S. W. monsoon. In working to windward from Cape Guardafui to Burnt or to Mait Islands, good sails and rigging should be bent, as gusts of wind are frequent in this portion of the sea.

During the month of May the winds are less fresh and keep more to the S. than during the other months, which permits running to the west in the Gulf of Aden, along the coast of Africa, with facility. In May, Aden can be crossed with more certainty than at any more advanced period of the year.

November and December. Leaving Bombay, Surat, or any of the ports of the north coast of Malabar, in November or December, for the Red Sea, steer to pass between Socotra and the coast of Arabia, and then to the west toward Aden. A good lookout should be kept for Vigias, and frequent soundings taken. At this period the winds are fresh, especially to the west of Socotra; the weather is overcast, and it is difficult to recognize the land; this, however, is not so necessary at this season, when the straits should be quickly cleared.

January and February. In January and February, the winds are nearly the same, but in general more moderate, and the weather clearer. At this period, the northeast point of Socotra can be made, if it is deemed advisable; pass along the north coast of this island and steer toward Aden, or as before mentioned, to the north of the island, without sighting it and steer for Aden.

March and April. In March and April the winds are less regular than during the four preceding months, (November to February,) they often vary from N. N. W. to N. N. E., and alternate calms, light breezes, and sometimes sharp squalls are encountered; however, the weather is, in general, good for a month.

Leaving Bombay at this season, a course should be made to pass to the south of Socotra; as, from the first part of April, the N. E. monsoon ceases in the vicinity of this island, and also near the coast of Arabia; it is replaced by light breezes, from S. W. to W. with frequent calms. The currents setting to the N. commence at this period to the

north of Socotra, as also between this island and Cape Guardafui. It is then prudent, toward the end of March or at the commencement of April, to pass thirty-six miles to the south of Socotra, so as to steer toward Cape Guardafui with the winds from S. W., which should be here met with.

When late in the season, and after making the land near Cape Guardafui, if the month of April is well advanced, it will be well to keep near the land as far as Burnt Island and then run for the Cape of Aden. During the months from May to August, the season of strong winds from S. W. to W. S. W., it is sometimes very difficult to go in shore from Cape Guardafui to Burnt Island; it is, however, the best route to follow, and it will be most prudent not to steer for Aden until Burnt Island has been passed. With a good sailing ship the Strait of Bab-el-Mandeb may be reached in working to windward, provided that every favorable circumstance offering is taken advantage of; at the epoch of the new and full moon, the current will at times be found running to the W., and a slight variation in the wind. At this period a short passage can often be made by keeping near the coast of Africa until sixty miles to westward of Burnt Island and then steer to approach the Strait of Bab-el-Mandeb as near as the wind will permit.

Leaving Anjenga, Cochin, Calicut, Mahe, or the other ports of the south coast of Malabar, run to the westward during November, December, January, and February, and take the most direct of the Laccadive Channels. Leaving Anjenga or Cochin, pass to the south of Seuhelipar, keeping on the parallel of  $9^{\circ} 20'$  or  $9^{\circ} 30' N.$ ; if leaving Mangalore or Mahe, a course may be taken to the north of all these islands. In March and April, when the winds from N. and N. W. still prevail between the Malabar coast and the coast of Africa, it will be preferable to follow the coast of India as far as somewhat to the north of Mount Dilly, and then pass to the northward of all the islands and banks.

Vessels leaving Anjenga or Cochin should take the Nine Degrees Channel, and should approach the Islands of Valpeni and of Seuhelipar, as the currents during this season run to the S., toward the Maldives. In November, December, and January, after passing these islands, they should steer so as to pass near the coast of Socotra.

In February they should run to the westward, keeping on the parallel of  $11^{\circ}$ , or  $11^{\circ} 30' N.$  At the end of March or

May, June,  
July, and August.

Routes from  
the ports of the  
south coast of  
Malabar to the  
Red Sea.

in the beginning of April, it will be prudent to take that of  $9^{\circ}$  or  $10^{\circ}$ . In April the winds are generally from the N. and N. W., when keep as close to the wind as possible, making occasional short tacks to the northward, in order not to make too much to the southward. Too many of these tacks should not be made, as the main object is to get to the west. During this last month there is no reason for going near the Equator; while in May, when the S. W. monsoon commences, a vessel should get well to the south.

At the end of April and at the commencement of May, when but  $2^{\circ}$  or  $3^{\circ}$  to the west of the coast of Africa, winds will very probably be found from S. W. varying to the S., near the land. At this period it is better to try and make the land to the south of Cape Guardafui, for in falling to leeward of Socotra the passage becomes very uncertain, and it may be necessary to cross the line to get to the westward.

Routes from  
the east coast of  
India to the Red  
Sea.

On leaving the ports of the east coast of India for the Red Sea, if before the month of April, pass along the south coast of Ceylon and along its west coast as high as Caltura, from thence continue the voyage, by taking the Nine Degrees Channel, as before directed for vessels from the ports of Cochin and Anjenga.

In April, the westerly winds prevail seaward from the southwest part of Ceylon, and it may be difficult to double this island to reach the Nine Degrees Channel, accordingly, from the southern part of the Gulf of Bengal. After March the route to the south should be taken when bound to the Red Sea; keep on the parallel of  $9^{\circ}$  or  $10^{\circ}$  S. and pass to southward of the Chagos. At the commencement of the season the winds will be found more favorable for getting to the westward than by the direct route between the Maldives and Speaker Bank.

The Straits of  
the Red Sea.  
The Little  
Strait.

The Red Sea is entered by two channels called the Little and the Great Straits; the first is between Cape Bab-el-Mandeb and the Island of Perim; the second, between that island and the coast of Abyssinia. The Little Strait is the most frequented, as its depth admits of anchoring. On approaching this strait the soundings diminish abruptly from nineteen to nine fathoms. With a favorable wind, keep in the middle of the Little Strait or nearer to the Island of Perim than to the coast of Arabia. There is no

danger in this route, though the soundings are very irregular, varying from thirteen to seven fathoms.

When leaving the Little Strait, if Mocha cannot be reached before night, and if the weather is threatening from the southwest, it will be well to anchor under shelter at the opening of the strait to the north of Cape Bab-el-Mandeb. In this anchorage the sea is smooth; outside the strait there will be a rough sea, and it would be found very difficult to reach Mocha.

The Great Strait is about nine or ten miles broad; it is bounded on the west by the coast of Abyssinia; to the south are the little islands called The Brothers; on the east by the Island of Perim. The latter is surrounded by a narrow plateau of soundings. In the middle of the strait there is no bottom found with ninety fathoms of line. At a short distance from The Brothers and near the coast of Abyssinia, there are irregular soundings in from twenty-five to thirteen fathoms. As there is no anchorage in the Great Strait except near the Island of Perim, in the vicinity of the islet of The Brothers, to the northwest of the group, or near to the coast of Abyssinia, the Little Strait is generally preferred, whether for entering or leaving the Red Sea.

With a good breeze, however, or during the night, the latter is preferable, and it would not then be prudent to take the Little Strait.

Entering the Great Strait, keep close to the Island of Perim, where there is anchorage, in case of the wind failing, or being drifted toward the Brothers. On entering the Great Strait during the night, short tacks should be made, keeping to the west of Mocha until daylight, and near the coast of Abyssinia in from fifteen to nineteen fathoms of water. It is better to keep under way thus than to anchor where, with a strong breeze, there is danger of losing the anchors. If it is decided to keep on during the night, care should be taken not to pass Mocha; for, in the season of the southerly winds, the currents run strong to the N. along the coast of Abyssinia.

We will say nothing further on this subject, as the navigation of the Red Sea pertains to local navigation, for which we would refer to the excellent directions of Horsburgh, and especially to those of Captain Moeresby.

It is often difficult to get out of the Red Sea, and this is rarely attempted from September to April, when the winds



are from the eastward in the gulf outside the Strait of Bab-el-Mandeb. If a vessel succeed in getting out of the gulf she is still threatened by the N. E. monsoon, if bound to India or the Persian Gulf.

In April, when the winds from W. and S. W. commence near the south coast of Arabia, there is not the least difficulty in leaving the Red Sea for the Gulf of Persia or the coast of India. The favorable season for leaving this sea is from April to September. Bound to Surat, Mocha should not be left before the first part of September, so as not to arrive at the roadstead of Surat until about the 20th of this month, or at the end of the S. W. monsoon. It is imprudent to anchor in this roadstead before this period. Outside the Strait of Bab-el-Mandeb, steer to the eastward in the middle of the Gulf of Aden, where the breeze is more steady than near the coast. However, should the breezes be light and variable, try not to approach the coast of Africa, on account of the calms and strong currents to the W. Bound to Ceylon, or more to the eastward, a course should be made to take the Eight or Nine Degrees Channel between the Laccadives and the Maldives. This route should be adopted from March to November, and then it is preferable to all others. It can even be taken in the strength of the N. E. monsoon, by keeping near to Seuhelipar, in taking the Nine Degrees Channel. From October to March it is preferable to pass to the northward of the Laccadives, and steer to the south along the Malabar coast as far as Cape Comorin, and then run toward Point de Galle.

Favorable season for going to the Gulf of Persia.  
From November to February.

The most favorable season to go from the coast of Malabar to Muscat, or to the entrance of the Persian Gulf, is from November to February. During these four months, leaving the Gulf of Bengal, Ceylon, or the ports situated to the southward on the Malabar coast, the coast should be followed, taking advantage of the land and sea breezes, which are found as far as the high land of St. John, in the parallel of  $20^{\circ}$  N.\* There leave the coast, and steer to the northwest, when the winds permit, so as to pass near the coasts of Guzerat, Cutch, Scinde, and Beloochistan. After passing Cape Diu it will always be prudent to get well to the north, and, if the winds permit, try to reach the parallel of  $23^{\circ} 50'$  or  $24^{\circ}$  N. before being on the meridian of  $62^{\circ}$  E. longitude; as, during this season even, the winds

\* This point is ordinarily reached in ten days.

often come from the N. Crossing the Gulf of Cutch, there are frequent squalls from the E. or E. S. E., with a somber and cloudy sky. When the wind goes to the N. the weather is fine, with a clear sky. With N. E. winds there are white squalls, which are indicated only by a little white cloud, which would pass unnoticed were it not for the considerable increase of the wind. Running to the west, on the parallel of  $24^{\circ}$  N., the wind will probably be fresh until about half the breadth of the Persian Gulf is open. At its entrance, violent squalls sometimes come from the N. W. If desired to go up the gulf, keep near the Persian coast. If to Muscat, steer for this port, keeping a little to windward. During this season the passage from Bombay to Muscat is about ten to twelve days.

When leaving Bombay at this season, steering direct for the Persian Gulf, winds are sometimes met from the N., which do not permit the coast to be reached to windward of Ras-el-Gat, and if the coast is closely approached, calms may be expected. These cannot be avoided but by keeping fifteen or eighteen miles from the land.

In March, April, and May a course should be made directly for Muscat, on leaving any port of the coast of Malabar. In fact, as at this season the land and sea breezes cannot be relied on, it would be very difficult to get to the northward. A vessel should then stand to sea, if to the northward of the Laccadives, or pass through the most convenient of the channels, if leaving a port of the south coast of Malabar.

Routes from  
March to May.

When at sea, the sea will be smoother than near the land, and the winds are variable from N. to W. N. W., though most frequently N. N. W. and N. W. Take the tack to the westward when the wind turns toward the N., and the tack to the northward when it turns to the W., so as to make, if in the month of March or the beginning of April, Ras-el-Gat as soon as possible.

In the latter part of April and during the month of May, it is prudent to make to the west as much as possible, in order to take advantage of the winds from W. and S. W., which are certain to be met with on opening the gulf which joins the Red Sea, and on approaching the coast of Arabia. It is then necessary to make for the coast to the south of Ras-el-Gat, in the vicinity of which the winds from S. W. to S. commence to be felt, from the month of March to the first part of April, and blow with force in May.

Inside of Ras-el-Gat, at this season, the alternate land and sea breezes blow, at least unless there are heavy squalls from the N. W. coming from the Gulf of Persia, which happens once or twice during a month.

During these months, the coast can be kept at a distance of five or six miles, and good passages from Bombay to Muscat are about twenty days.

September and  
October.

In September and October, the period of the change of the monsoon, the passages become long; the winds are then variable between the coasts of Arabia and Malabar, though they are most frequently from the N. W., particularly in the vicinity of Bombay and to a distance of one hundred and twenty or one hundred and eighty miles from the coast, near which there is often a very heavy swell.

Toward the end of September, and during October, a vessel should work along the land to reach the parallel of  $19^{\circ}$  or  $20^{\circ}$  N. latitude; then stand seaward and take advantage of the variations of the wind for not descending below the parallel of  $19^{\circ}$  N. in crossing the Persian Gulf.

If bound to Muscat, try to make the land in the vicinity of Ras-el-Gat, where the winds will be variable along the coast of Arabia. If going up the Persian Gulf, it is necessary, on the contrary, as far as Cape Iask, to keep as much to the north as possible, near the coast of Beloochistan, and avoid the coast of Arabia.

Southern routes  
from Bombay to  
Muscat.  
June, July, and  
August.

The southern route from Bombay to Muscat, or to the Persian Gulf, necessitates sailing four thousand five hundred miles to accomplish a direct distance of seven hundred and eighty miles, the distance from Bombay to Ras-el-Gat. This route is generally taken in June, July, and August by vessels bound to the Persian Gulf or to the Red Sea.

On leaving Bombay get into soundings of from nineteen to twenty-five fathoms, and work to the southward along the coast in from thirty-four to eighty-nine fathoms, on the on-shore tack, not approaching nearer to the land than nineteen fathoms, and not leaving the bank of soundings on the off-shore tack, especially when passing inside the Laccadives. At this season, along the coast, there are strong winds from the S. W. and W. S. W., at times accompanied by violent squalls from the W. and W. N. W., with rain.

On reaching the parallel of  $4^{\circ}$  S. it is probable that the vessel will be nearly on the meridian of the south point of Ceylon, and in June and July the general winds from S. E.

will be found; in August it will be necessary to go further south to get them.

In the first two months, with the S. E. trades, a vessel can generally run to the west between the parallels of  $4^{\circ}$  and  $4^{\circ} 30'$  S. to pass between the southern extremity of the Maldives and Speaker Bank. This is the first southern route. In the last month, it is preferable to pass to the southward of Diego Garcia, and to keep in  $9^{\circ}$  or  $10^{\circ}$  S. latitude.

This route, the second southern route, is, in general, more sure than the former, as the winds are steadier and stronger than in the vicinity of the Equator. However, vessels which have run to the west on the parallel of  $4^{\circ}$  S. during the months of June, July, and August have found the sea smooth and the winds regular from E. S. E. to S. E. On the other hand, during March or at the end of August, the first route should not be followed, for the winds frequently vary to the W. and cause currents running to the E.\*

When the trade-winds prevail the current in the second southern route is found setting to the W. nearly the whole year, and it should be preferred to that on the parallel of  $4^{\circ}$  S. for vessels leaving the east coast of India for Bombay, the Gulf of Persia, or the Red Sea, as also for those bound from Bombay to these seas.

It is necessary to get to the west before leaving south latitude; consequently, if going to the Red Sea, it is prudent to pass near the Seychelles; going to Muscat or the Persian Gulf, it is well to go  $1^{\circ}$  or  $2^{\circ}$  to the west of Ras-el-Gat before quitting the trade-winds, for during the S. W. monsoon, generally between the Equator and the coast of Arabia, the winds are from W. S. W. or W. N. W., always accompanied by easterly currents. It then becomes impossible to make to the west when to the northward of the Equator, and all that can be done is not to fall to leeward of north; as the sea abeam occasions a strong drift, it is necessary then to get at least on the meridian of Ras-el-Gat, to reach it with the westerly winds. Make this cape or the land to the southward of it, without approaching the dangerous Gulf of Massera; but having doubled the island of this name, which is to seaward of it, keep to the wind as much as possible to make the land.

On approaching Ras-el-Gat, the S. W. winds, which are

\* Some writers say that the first southern route should not be adopted except in July.

very strong to the south of the cape during this monsoon; as the cape is turned haul gradually to the S. E.; when it comes to S. the S. W. monsoon ceases, and as far as Muscat there are only variable breezes. Once or twice during a month within the cape, strong breezes from S. E. occur, lasting two or three days and they extend to the bottom of the gulf; the winds from N. W. prevail however in these localities.

Route direct  
from Bombay to  
Muscat.

The direct route from Bombay to Muscat is very seldom followed by vessels of commerce during the strength of the S. W. monsoon; by ships of war it has been adopted in preference to the long circuit of the southern route; taking this route a vessel can make to the westward, between the parallels of  $15^{\circ}$  and  $19^{\circ}$  N. latitude. Some ships have made the same passage without going to the south of  $13^{\circ}$  N. latitude.

Routes from  
the Persian Gulf  
to the coast of  
India.

N. E. monsoon.

In leaving the Persian Gulf from September to April, in the season of northerly winds, bound to the ports of the west coast of India, as soon as Cape Isak is doubled, follow the coast of Beloochistan, keeping at such a distance from it as not to be exposed to the variable winds and calms existing near the coast. On approaching the meridian of Cape Mouaree it will be advisable to steer to the southeast to cross the entrance of the Gulf of Cutch and pass a good distance from the coast of Guzerat; having passed Cape Diu at a distance of from thirty-six to fifty-two miles, a straight course can be made for Bombay, if bound for this port; or, if for Surat, steer for the high land of St. John.

When the port of destination is on the southern coast of Malabar, the Gulf of Bengal, &c., the course should be made as above mentioned, passing the same distance from the coasts of Beloochistan and Guzerat; however, with the winds at N. E. and N. N. E., it is necessary to keep sufficiently to the northward to make the Peak of Barcelore, then pass between the Laccadives and the coast.

S. W. monsoon.  
September.

During the S. W. monsoon from March to September, on leaving the Gulf of Persia for ports of the west coasts of India, a vessel should get in the latitude of Kunday, ninety or one hundred and twenty miles from the land, and then steer to the eastward for the port of destination. Bombay is the only port of this coast which should be frequented at this season; the road of Surat is very bad, and ships bound there would do well in not leaving the Persian Gulf before September. Then, keeping a good distance from the coast

of Beloochistan, steer so as to pass thirty-six to forty miles from Cape Diu; when opposite this cape, on the parallel of  $20^{\circ}$  N., steer to the eastward for the high land of St. John. Care should be observed in making the land not to make it too much to the northward. By night the soundings should not be diminished below thirteen fathoms; having made the land run along it as far as Surat, keeping in at least ten or eleven fathoms of water until abreast of Damaon, when keep in from seven to five, at low water, in going to Surat River.

In the same season, going to the Gulf of Bengal, steer so as to pass to the west of the Laccadives; then between these islands and the Maldives, or rather through the channels among these islands; then steer toward Cape Comorin. It is better at this period to pass to the west than to the east of the Laccadives, for there the breezes are good and the weather fine, while to the east squalls and rain occur during the whole of the S. W. monsoon.

### THIRD DIVISION—THE GULF OF BENGAL.

The Gulf of Bengal is so important as to require us to give particular attention to its navigation. We will, therefore, indicate the routes from the ports of the south to those of the north, and *vice versa*, during both monsoons, and also the routes on leaving the gulf for the ports of the west coast of India, the Gulf of Persia, the Red Sea, &c. We take the following remarks from D'Après de Manneville, Horsburgh, and Captain Miller:\*

The S. W. monsoon, is the most favorable time for going to the coast of Bengal from the ports situated to the south and west in the gulf. Leaving the coast of Malabar or the south coast of Ceylon, at the end of February or in the first part of March, for the Bay of Bengal, a vessel should, with moderate breezes and favorable currents, get to windward along the east coast of Ceylon as far as Baticolo, and then steer as direct a course as the winds permit for the coast of Orissa, so as to make the land near the parallel of  $19^{\circ}$  N.; from thence follow the land as far as Point Palmyras and shape a course to reach the coast of Bengal. If in making this route the winds should be strong from N. E., and the currents adverse in the locality of the Bassas, on the

Special navigation of the Gulf of Bengal.

Routes from south to north. S. W. monsoon. Route from the coast of Malabar and ports of Ceylon to Bengal. February and March.

\* *Nautical Magazine*, 1839.

southeast of Ceylon, run to the eastward close-hauled, and it is probable that at some distance from the coast the winds will be found varying from N. W. to S. W. and sometimes from the S. E., which will be favorable.\*

Route from the  
Coromandel coast  
to Bengal.  
February and  
March.

During the same months when leaving ports of the Coromandel coast for those of Bengal, it is prudent to keep well off the land, in order to take advantage of the variable breezes which sometimes blow from S., while on the coast and in its vicinity the sea breezes are met blowing from the E., variable to N. E., and render it difficult to get to the northward. When at sea, should the winds permit, steer to make the coast of Orissa about the parallel of  $19^{\circ}$  N.; if unable to do so, make as soon as possible the pagodas of Jaguernaut or the Black Pagoda.\*

Route from the  
Strait of Malacca  
to Bengal.  
February and  
March.

In these months, on leaving Acheen or the Strait of Malacca, the Gulf of Bengal can be entered by passing either to the north or south of the Nicobar Islands, or through the channels formed by them, according to the wind; then steer to make the coast of Orissa, as already directed.

Routes from the  
ports of Ceylon  
and Coromandel  
coast to Bengal.  
From April to  
September.

When the S. W. monsoon is well established, that is, from the first part of April to the middle of September, it prevails generally near the west coast of the gulf. At this period on leaving the ports of Ceylon or those of the Coromandel coast for Bengal, it is not advisable to keep off shore, for the winds sometimes haul to the westward at sea. But the coast should not be hugged too close until to the northward of Vizagapatana, to avoid the strong sea breezes blowing sometimes from S. E., which are found at the entrance of the great bays between Madras and this port. The currents from N. E. are also strong at this season; if not certain of the distance from the land, it will be prudent to ascertain it in the latitude of  $18^{\circ} 30'$  or  $19^{\circ}$  N. ;\* and from thence steer for Bengal, following the instructions given in Horsburgh for making the land of the Hoogly during this monsoon.

Route from the  
Strait of Malacca  
to Bengal.  
From April to  
the middle of  
September.

At the same period, when leaving Acheen or the Strait of Malacca for Bengal, take the passage to seaward, crossing the Surat Channel and that of Pulo-Brasse, if leaving Acheen; and that between Pulo-Way and Pulo-Malora, if from the Malacca Strait. This last, says Captain Miller, is the best to take in going from the Strait of Malacca to Acheen and for reaching the two other channels mentioned; pass then to the west of the Nicobar and Andaman

---

\* D'Après de Manneville.

Islands. The channel between Pulo-Way and Pulo-Rondo can also be taken in coming from the Strait of Malacca, or that between Pulo-Way and Pulo-Brasse when leaving Acheen; in this case a vessel will pass to the eastward of the Nicobar Islands, and the gulf will then be entered between these islands and the Little Andaman by the Ten Degrees Channel, the passage can also be made to the eastward of the Andaman Islands, taking the channel between the Great Andaman and the Cocos Islands, from whence the coast of Orixá should be reached in the vicinity of Point Palmyras, unless the wind should vary to W. S. W. and the current cease to set to the N. E., which often happens in the strength of the monsoon. It is on this account that during this season, when leaving Acheen and the Strait of Malacca, it is preferable to take the passage to the west of the Nicobar and Andaman Islands.

The route which should be followed in going from Ceylon and the Coromandel coast to Bengal, after the 15th of September, and in October, is very different from those heretofore mentioned, as the S. W. monsoon draws to its end, and the winds often come from the N. E. It is then necessary to keep at a good distance from the coast, and nearly in the middle of the Gulf of Bengal. If the winds still blow regularly from S. W., keep direct for Point Palmyras. If, on the contrary, they vary and haul to the N. or N. E., it will be necessary, while taking advantage of the favorable shifts, to make to the eastward, until not more than sixty or ninety miles from the Andaman Islands or Cape Negrais; then tack to the N. W., making as much to the north as possible. It will be more advantageous to work to windward at sea than near the coast of Aracan, though this coast may be kept near in October and November. In leaving Pondichery or Madras at this season, if the wind is light or variable from the eastward, a vessel may be drifted by the southerly current near the east coast of Ceylon before she is able to get to sea. It is necessary to guard against this. At the commencement of the N. E. monsoon, it is necessary to keep off the coast of Orixá, to avoid the current setting to the S., which is then very strong.

If, at this period, from any cause, the land should be made more to the southward than the False Point of Palmyras, there would be a risk of the loss of the voyage, or a considerable retard, from the difficulty of getting to the

End of S. W.  
monsoon.  
Commencement  
of N. E. mon-  
soon.  
Route from  
Ceylon or Coro-  
mandel coast to  
Bengal.



north against the current, which attains its greatest velocity in November and December. It is then more advantageous, even at the end of December, when this current begins to get weaker, to work to windward in the middle of the Bay of Bengal, or near its eastern rather than on its western coast, in order to run from a well-determined position for the tail of the Sangor Bank, or for the eastern sea reef. On the west coast, at this period, the currents attain a velocity at times of three miles per hour. When the land is made to the north of the False Point Palmyras, the tides should be taken advantage of in doubling Point Palmyras, anchoring when necessary, and the tacks should not be continued when unfavorable.\*

**N. E. monsoon.** During all the N. E. monsoon, when leaving the Coromandel coast for Bengal, a vessel should take the east coast and make her northing either along this coast or in the middle of the gulf, which is preferable, as the currents to the S. are thus avoided, which often exist at this period on the east coast. A similar course should be adopted after entering the Bay of Bengal, to make to the north and reach the mouth of the Hoogly.

Routes from Acheen or the Strait of Malacca to Bengal during the N. E. monsoon.

On leaving Acheen, or Malacca Strait, for Bengal, during the N. E. monsoon, take the route which appears most advisable, according to the winds and the existing circumstances, passing either to the west or east of the Nicobar Islands in entering the Gulf of Bengal by one of the channels between these islands and the Little Andaman. However, on leaving the Strait of Malacca, Horsburgh thinks it preferable to steer for the Island of Narcondam, after taking a departure from the south point of Junk Ceylon; then pass to the north of the Great Andaman, between this island and the Cocos, or through the channel formed by the latter and Preparis. Then take the starboard tack in running for the entrance of the Hoogly, making some boards if the winds vary. Care should be taken to keep a moderate distance from the coast of Aracan, and all the east coast of the Bay of Bengal.

Going from south to north in the Gulf of Bengal during the N. E. monsoon.

During the N. E. monsoon the wind in the Gulf of Bengal is generally moderate, and it often veers to the E. In this monsoon the sea is generally smooth. In reaching the gulf toward the first of February, time should not be lost working to the east, for the winds from E. and S. E. commence

\* D'Après de Mannevillette and Horsburgh.

nearly at this period on the coast of Ceylon, and to the north of the Bassas. The current, besides, runs up along the Coromandel coast. It will then be advantageous to keep near the land. During the strength of the monsoon, however, it will be better to keep at sea and tack in the middle of the gulf, or on its east coast. Toward the middle of September, when the Calcutta pilots change their station from Point Palmyras to the Sand Heads, a vessel should make to the eastward in the Bay of Bengal, in order to strike soundings to windward of the light-vessel. The current runs to the W. with great rapidity toward the end of September and in October, and if the land should be made to leeward, it will be very difficult to reach the Sangor Channel.\*

The most favorable time for a quick passage from Bengal to the Coromandel coast, or to the ports of the southern part of the gulf, is between the middle of October and the middle of February, which is the strength of the N. E. monsoon.

Routes from  
north to south.  
N. E. monsoon.  
Route from  
Bengal to the Co-  
romandel coast.

When leaving Bengal in September for Pondichery, Madras, or any port of this coast, with light breezes from S. S W. to W., and a feeble current running to the N., a vessel should keep a short distance from the west coast of the gulf. Should the wind be from the S., keep along the west coast and tack to get to the southwest, without leaving the plateau of soundings, if possible. Should nothing be gained, then stand well out to sea, and at a good distance from the land work to windward, taking advantage of all variations of the wind. At this period the currents are very irregular, while near the coast they run with velocity to the N. E. They are very weak at sea, and, in this month, when the current runs to the N. E. at sea, they are not felt near the coast. During this month the passage may be shortened sometimes by keeping near the coast, at others out to sea, according to circumstances.

September.

However, a vessel bound for the Coromandel coast during September, by the outside route, should never run as far to the eastward as the middle of the gulf, as the westerly winds prevail there at this period.

In making the same passage from Bengal to the Coromandel coast, from October to December a vessel should keep at a suitable distance from the coast, and guard against the

Route from  
Bengal to the Co-  
romandel coast.  
From October to  
December.

\* Captain Miller, *Nautical Magazine*.

gusts of wind which occur at this period. After the middle of October, on leaving Bengal, the winds may be found from N. E., which often last for several days in succession; but advancing toward the south, the winds are generally variable; if well off the coast, they will be from the S. W., and near the coast from the eastward.

Whatever may be the port of destination on the Coromandel coast, after the 15th October, the land should be made about forty miles to the north of it. Going to the ports of the east coast of Ceylon, the same precaution is necessary, on account of the strong currents running to the S., and Palk Bay should be avoided, as at its entrance currents are often found setting to the W., which makes the coast dangerous with winds from the N. E.

Route from  
Bengal to the  
Coromandel coast  
January.

Leaving Bengal in January, for the Coromandel coast, a vessel should keep at a moderate distance from the coast, and outside of the zone of light, variable breezes, and steer directly for the port of destination, when a little to the northward of its parallel. If the wind should be from N. E., fresh, it would be prudent to make the land more to the northward of the port.

Route from  
Bengal to the Co-  
romandel coast.  
February.

In making the same route in February, a vessel should, immediately after leaving the Hoogly, keep well to seaward of the coast of Oriza, and run to the south, in order to avoid the calms and light alternate breezes which prevail near the coast, while at sea and in the eastern part of the gulf the winds are usually moderate from N. E.

During the first part of February on the Coromandel coast, the winds are generally from S. W., and the current runs to the N. A vessel should then keep at sea and not approach the coast until able to make it to the southward of the port of destination. However, should the winds be from N. or N. E., the port may be run for, when in its latitude, taking care, from the first of February, not to fall to the northward.

Ceylon.

During the N. E. monsoon, from September to March, vessels going to Ceylon should make the land to the northward of their port, if it is situated on the east coast of the island. If bound to the west coast, or to the coast of Malabar, the island should be sighted in the latitude of Aganis, or to the north of the Bassas; then run along the S. and S. W. coasts of the island.

Leaving Bengal for Acheen or the Strait of Malacca during the N. E. monsoon, from September to May, steer to the southeastward and pass between Cape Negrais and Prepara Island, or between the latter and Cocos Islands; from thence a direct course may be taken to Pulo-Way, if bound to Acheen or to Pulo-Bouton, if bound to Malacca Strait or Prince of Wales Island. The currents on the east side of the bay and in the vicinity of the Andaman Islands in March generally set to S. W. and S., making it advisable to keep well to the eastward if it is intended to pass through any of the channels to the northward of these islands. If a vessel fall to leeward she should steer to the westward of the Great Andaman, and, should the currents permit, try to pass through the Duncan Channel between it and the Little Andaman; otherwise, work to the eastward in the Ten Degrees Channel, comprised between the latter and Carnicobar Island, which will considerably increase the passage; it is therefore prudent to keep well to the eastward on leaving the Hoogly, so as to pass to the northward of Prepara. Between this island and Junk Ceylon the currents are very variable during the N. E. monsoon; at its commencement they generally set to the N. W.; in March and April to the S. and S. W.

Routes from  
Bengal to Malacca Strait.

Leaving Bengal in March and April for the Coromandel coast or Ceylon, the winds will be found generally variable from S. S. W. to W., against which it is necessary to work to the southward, and, should they permit, steer south or south-southeast. In the middle of the gulf, at this period, there are sometimes light, variable breezes, most frequently from N. to W., while on the Coromandel coast the S. W. winds prevail. To take advantage of the northerly breezes which exist during these months keep to the eastward of the meridian of Point Palmyras until well to the southward, and take care, especially toward the end of April, not to approach the Great Andaman, for this island, being then to leeward, would be dangerous in a storm from the west; profit by all changes of the wind to make southing, and, having crossed the gulf, get at least sixty miles to the southward of the port of destination before steering for it, making allowance for the current setting to the northward with southerly winds, which will be found near the land. In the same season winds from the N. W. are generally found between the Andaman Island and the east coast of the gulf; on this

S. W. monsoon.  
Route from  
Bengal to the Coromandel coast.  
March & April.

account some ships bound to Europe or for the west ports of India from Bengal, pass to the eastward of these islands, and then either north or south of the Nicobar Islands, as may appear desirable. Horsburgh says that when the winds permit, the route to the westward of all the islands is preferable, taking care to avoid the bank with four and a half fathoms on it, which is about twenty-seven or thirty miles to westward of the Great Andaman; on that account vessels should pass down the bay well to the westward of these islands, particularly late in April.

Route to Ceylon.

Going to Ceylon at this period a vessel should keep well to the eastward until on the meridian of Palmyras on the parallel of  $10^{\circ}$  N.; then approach the coast, taking care to make the land well to the southward of the port. If bound to the west coast of Ceylon or to that of Malabar, after reaching the parallel of  $9^{\circ}$  steer for the southern part of Ceylon, and endeavor not to make it to the northward of the Great Bassas.

During these two months, when bound to the Malabar coast, a vessel should not keep near the west coast of Ceylon, but, on the contrary, get well to the westward at this season to double Cape Comorin without difficulty.

Route for the Malacca Strait from March to September.

Going from Bengal to Acheen or the Strait of Malacca, during the S. W. monsoon, nearly the same route should be taken as in the N. E. monsoon; steer to the S. S. E., if the winds permit, until to the southward of  $15^{\circ}$  N. latitude; from thence steer toward the Cocos Islands when sure of the position, or, in preference, for Landfall Island, situated near the north point of the Great Andaman. When the position is not well ascertained it will be prudent to reach the parallel of  $14^{\circ}$  S. before steering toward the Cocos Islands, to pass to the southward of these islands. After passing them, hug the wind, running to the south, so as not to approach the islands off the coast of Tanasserim, and also keep clear of the Andaman group. It is advisable, if possible, to steer directly for Barren Island, which can be seen thirty-nine miles, and having passed this island on the side which may appear most desirable, keep to the wind if bound to Acheen; it will not be necessary to hold so close to it if going to the Strait of Malacca. It will be necessary, however, to keep to the south, to pass at a good distance from Seyer Islands and the southwest point of Junk Ceylon, in case S. W. winds should prevail off this point, which is not always the

case during this monsoon. From the point of Junk Ceylon a direct course should be made for Pulo-Bouton, and thence to Prince of Wales Island.

On leaving the Bay of Bengal,\* during the S. W. monsoon, a vessel should keep well to the westward and avoid the Andaman Islands, on account of the gusts of wind which occur in their vicinity. In June and even July deep-laden ships have encountered these gusts, which occasion a very heavy sea, and been lost in the northeast part of the bay.

Leaving the Bay of Bengal during the S. W. monsoon.

In order not to get over to the eastward after leaving the Hoogly, it is necessary, as soon as possible, to run for the western shore, to make it, should the winds permit, in the vicinity of False Point Palmyras; it is probable that during the night the winds will haul a little toward the land and will be favorable to make southing, while in the day they haul a little to seaward; these variations should be taken advantage of, by being near the land between 2h. and 3h. in the morning. In June and July these breezes are often well marked, but are not always found; with the winds of the S. W. monsoon it is still preferable to be near this coast rather than in the middle of the bay, where the sea is always heavy; and a vessel should not leave it as long as a little can be gained to the southward.

If near the coast of Orixá the winds should be so adverse as not to allow anything to be made to the southward, then run to the southeast sixty or seventy miles from the land, where the currents are weaker; it will not be prudent to go further to seaward with the hope of finding better winds.

By keeping near the land, or a little distance to seaward, and taking advantage of the variations of the winds, (for the more to the southward the greater is the certainty of finding the breeze off the land,) there will be less difficulty in getting to windward than by running to seaward.

Having reached Point Gordeware, the coast to the southward of this point should not be approached on account of the deep bays between this and Pulicat, but make a stretch to pass to the southward of them, keeping at a convenient distance from the land. From Pulicat southing can readily be made with the land breezes during the night, and the S. E. winds which prevail in the day, by keeping near the Coromandel coast. If bound to Trincomalee, continue to

---

\* We would refer to the distinction made in Chapter I between the Gulf and the Bay of Bengal.

work along the coast of Coromandel to Negapatam, when cross the opening of Palk Bay for the coast of Ceylon.

Route going  
down the Gulf of  
Bengal in the S.  
W. monsoon.

In going down the Gulf of Bengal during the S. W. monsoon the same directions may be followed until the middle of August. The route generally adopted is that on the west shore of the gulf. However, in going to the west coast of India, or to Europe, it is not necessary to keep as near the land as above indicated.

If on leaving Bengal the winds are found moderate from the W., take advantage of them to run to the southward; when they vary to S. W. or to S. S. W., make stretches toward the western shore, taking particular care on the eastern tacks not to get near the Andaman Islands. If southing can be made fast by keeping on the western coast, it will be prudent to continue so; but if, on the contrary, the progress is slow, it will be necessary to take the tack to the southeast, and profit by all the variations of the winds to make southing, by keeping in the middle of the gulf. When, with the prevailing winds, the vessel can pass ninety or one hundred and twenty miles to the westward of the Andaman Islands, the tack to the southeast should be continued, for then there is a probability of being able to pass to the westward of the Nicobar Islands and Acheen Head without tacking.

Captain Millar does not wholly agree with Horsburgh. He says that on leaving Bengal the tacks to the southeast should be taken, to try to pass to the west of the Andaman and Nicobar Islands. In case it cannot be done, he adds that instead of losing time in making tacks to the westward, it will be more advantageous to pass to the north of the Andaman Islands through one of the channels of this group; that of the nearest islands being the best to follow. Then, when to east of the Andaman Islands, continue to the south, until the S. W. monsoon is lost, to leeward of Sumatra.

Near the coast of this island the winds will be found variable, and often favorable, which will admit of the gulf being again entered by the Strait of Surat or Pulo-Brasse, passing between Pulo-Way and the Island of Malora.\*

Strait of Ma-  
lacca.

On leaving Acheen or the Strait of Malacca during the same monsoon, a vessel should take the Surat passage, should the wind permit, or, says Horsburgh, should work close round the north end of Pulo-Brasse, where the current fre-

\* Captain Millar, *Nautical Magazine*, 1839.

quently runs to the westward among these islands, when at the same time it is running strong to the N. E. between Pulo-Rondo and the Nicobar Islands. Vessels should not, therefore, attempt to work out by the great channel.

On leaving the Gulf of Bengal, bound to the westward, a vessel should not stand too far to the east, and reach the zone to the south comprised between  $3^{\circ}$  and  $4^{\circ}$  N., for here the winds are very light, with frequent squalls from S. W., succeeded by calms.

As soon as a little to the westward of Acheen Head every advantage must be taken of the winds to get to the southward and into the S. E. trades, keeping well out from the islands near the west coast of Sumatra, and tacking with every favorable change of wind.

Captain Millar gives the following as general rules for navigating the Gulf of Bengal according to the season:

From 15th January to 31st May, in going up, take the west coast of the gulf; coming down, the east coast.

In June, July, and August, in going up, keep the middle of the gulf; coming down, take the eastern side, and even to the eastward of the Andaman Islands.

In September, October, and November, in going up, take the east coast; and on coming down, the west coast.

In December and to the middle of January, in going up and in coming down, keep toward the middle of the gulf, and make short tacks.

Leaving Tanore, Madras, Pondichery, or Karikal for ports of the west coast of India, the Red Sea, or the Gulf of Persia, the following course for leaving the Gulf of Bengal should be adopted: From Tanore, if the land and sea breezes are well established, try to descend with them as far as Pondichery. If this cannot be done, stand to seaward, as in leaving Pondichery; then steer about south-southeast, with the winds from W. S. W., or W., which are often found seaward. In the vicinity of the Equator the S. W. monsoon decreases, and the winds haul usually to the S.; run then to the southeastward, this tack being the one on which the most southing can be made.

The northern route is the most direct, but it should not be adopted except at the end of June, during July, and the beginning of August, when the S. E. winds approach the Equator.

After crossing the line as much as possible to the west-

Routes from the east coast of India to the west coast during the S. W. monsoon.

Northern route from the end of June to the middle of August.



ward, with the prevailing winds, as soon as the S. E. trades are taken, which at this season often happens about the parallel of  $4^{\circ}$  or  $5^{\circ}$  S., steer to the west between these parallels, or upon the latter. When approaching the meridian of  $73^{\circ}$ , do not run to the south of  $4^{\circ} 30'$ , in order to pass to the north of the Speaker Bank of the Chagos Archipelago; having passed it, keep to the west to cross the line again in longitude  $62^{\circ}$  or  $63^{\circ}$  E.

Southern route during the S. W. monsoon.

In May, the first half of June, the end of August, and the beginning of September.

The southern route is the more certain at every period of the S. W. monsoon than the northern. However, in making this route, as the sky is generally overcast, observations not always obtained, and frequent squalls, many prefer the northern route. Those who are obliged to cross the line to the east, on leaving the Gulf of Bengal, should always take the southern route. When this route is taken, the zone of the S. E. trade-winds should be reached as soon as possible in the region where they are well established at this period; that is, between the parallels of  $9^{\circ}$  or  $10^{\circ}$ ; then run to the west. If not certain of the position, it will be well to sight the Island of Diego Garcia, and then steer toward the southwest, to pass to southward of the Centurion Bank. Should this island not be sighted, run to the westward between the parallels of  $8^{\circ}$  and  $9^{\circ}$ , giving the shoals to the southward of the Chagos a good berth. Then return to the northward to cross the line on the meridian of  $62^{\circ}$  or  $63^{\circ}$ , as in the northern route, and whatever may be the destination, before returning to the northern hemisphere sufficient westing should be made to reach it with the winds of the monsoon, which are sometimes very strong, and occasion a rapid current to the eastward.

Persian Gulf.

Going to the Persian Gulf, the line should be crossed about the meridian of  $53^{\circ}$  or  $54^{\circ}$  E.; then conform to the directions given in the second division of this chapter.

Red Sea.

If bound to the Red Sea, when on the meridian of  $69^{\circ}$  E., a course should be made a little to the north of west; pass near the northern island of the Seychelles, and, if the weather permits, make the Island of Dennis or Bird Island, and cross the line between  $47^{\circ}$  and  $49^{\circ}$ , then steer for Cape Guardafui. The land should be made well to the southward of this cape, for, if a ship of ordinary sailing qualities falls to leeward, she will hardly be able to regain the coast; then work along the coast of Africa as far as Maït, or Burnt Island. Even more westing should be made near this coast,

as the prevailing winds are W., before keeping for Cape Aden or Ras-Amran, if the winds permit.

If bound to Bombay, Mahe, or any port of the west coast of India, a vessel should cross the line, says Horsburgh, in about  $64^{\circ}$  or  $65^{\circ}$  E. longitude: for, in the strength of the S. W. monsoon there are in the Gulf of Oman fresh breezes from W. and W. S. W., with a heavy sea. Generally, then, a vessel should not cross to the eastward of this longitude, so as not to bring the sea abeam in steering for the port.

In going north, when bound to Bombay, it is necessary to keep a good distance from the Laccadives, and the land should not be made before reaching the parallel of the Island of Kundary. Bound to Mahe, Calicut, or Cochin, pass through the Nine Degrees Channel.

We would remark here that, from April to October, the bad weather encountered on the west coast of India renders it quite dangerous. It is generally from October to January that the passages are made from the Coromandel to the Malabar coast, and from the latter for the Gulf of Bengal, the Strait of Malacca, Acheen, Bantam, Batavia, &c., from February to April. When leaving the coast of Malabar for Europe, a vessel should sail during December, or by the middle of January, especially if stopping at Mauritius or Réunion. Leaving later, it will be found difficult to double the Cape of Good Hope.\* It is useful to know these epochs for making short passages. We will conclude these directions for the Gulf of Bengal by giving some routes from ports of the west to those of the east coast and *vice versa*.

On leaving Bengal, during the N. E. monsoon, for Rangoon, sight Cape Negrais, and keep south of the Alguada Reef, which extends from the cape in this direction. In the same season, when from Pondichery, or the ports of the Coromandel coast, a vessel should stand to the northward and take the channel north of the Island of Preparis, or the south channel of this name, as most convenient. It is prudent at this period, after passing the reefs of Cape Negrais, to steer to the eastward, and sound frequently on approaching the coast, for there is little tide, and the currents from the rivers run generally to the S. W. or to the N. W.

Vessels going from the Strait of Malacca, Acheen, or the Nicobar Islands to Rangoon, during the N. E. monsoon,

Bombay, Mahe,  
&c.

Remarks.

N. E. monsoon.  
From ports on  
the east coast of  
the gulf to Ran-  
goon.

\* D'Après de Mannevillette.

should make the westernmost of the Mergui Islands, then work directly to the north for the entrance of Rangoon.

The above routes are equally adapted to the ports of the coast of Martaban.

**S. W. monsoon.** Leaving Bengal for Rangoon, during the S. W. monsoon, if the winds permit, try to make the island of Prepara, or the Cocos, which is preferable, then take the more convenient channel and steer to make the coast of Pegu, a little to the westward of the bar of the Rangoon. At the same season, leaving Pondichery, or the ports of the Coromandel coast, try to make Landfall Island, near the north point of the Great Andaman, if the winds hold from S. or the Cocos; if they blow from the W., pass through the channel which separates them. On leaving the Cocos Channel, steer to the east to make the Island of Narcondam,\* then to the north-east to make the coast of Pegu, a little to the west of the bar of the Rangoon. Should the land be made to the eastward, make the westing with the tide.

When leaving Acheen, or the Strait of Malacca, during the S. W. monsoon, make the Island of Narcondam, and from this island steer for the bar of the Rangoon.

**N. E. monsoon.** Leaving Rangoon for Bengal, during the N. E. monsoon, From Rangoon to the ports of the Gulf of Bengal. on leaving the river steer to pass outside the banks along the coast of Pegu, and to the south of the dangers off Cape Negrais, when keep near the coasts of Ava and Aracan in running for the Hoogly. If bound to Pondichery, or any port of the Coromandel coast, pass through one of the channels between Cape Negrais and Landfall Island, then steer for the port of destination, making the land to the northward before the month of February, and to the southward after that month.

If bound to the Strait of Malacca, during the same season, make the southern extremity of Junk Ceylon. If to the Nicobar Islands, or to Acheen, steer directly for the port of destination.

**S. W. monsoon.** On leaving the bar of Rangoon for ports of the Gulf of Bengal during the S. W. monsoon, a vessel should keep to the wind and stand out to sea, whether going to Bengal or to ports of the Coromandel coast, to Acheen or the Strait of Malacca. The pilot should not be discharged until well outside, in four and a half fathoms of water, with Elephant

\* We do not see the necessity of sighting Narcondam if the position is well ascertained.

Point to the northward. When this point bears N. by W. the vessel is nearly in mid-channel, in about four and a half fathoms of water; from thence steer to seaward; the soundings will soon decrease to four fathoms, when tack and stand toward the land until in five and a half fathoms, when tack again, the deepening of the water indicating the approach to the shoals off the coast. When the wood of China-Bucker bears W. by S., tack out to sea; it will, however, be advantageous to keep near the coast, to anchor, if necessary, and to profit by the tides, which are very strong. On reaching soundings of five and a quarter fathoms, the wood of China-Bucker should bear W. by N., distant twelve or fifteen miles.

Should night come before abreast of China-Bucker, a vessel can, by sounding constantly, drift with the tide to windward. After passing the River Dalla the coast should not be approached nearer than in soundings of six and a half to seven fathoms, until off Baragn Point, near which the bottom is sand mixed with shells. With a good sailing vessel, continue to work to the westward, to pass between the Island of Preparis and the Cocos, or through the channel north of Preparis; from thence, if going to Bengal, the road of Balassore can be reached if the winds do not vary but from S. W. to S. S. W.; otherwise tack and take advantage of the variations of the wind to get to the west. Going to Pondichery or to Madras during the S. W. monsoon, it will be found very difficult to cross the gulf on leaving the coast of Pegu, and vessels which do not sail well should not, perhaps, attempt it. With such vessels it will then be prudent to take the route adopted from Rangoon to Acheen, as follows: After taking advantage of the tides in working to the westward of Point Baragu, if bound to Madras, Pondichery, or any port of the Coromandel coast, for Acheen or the Strait of Malacca, if the wind holds to the W., stand to sea, and try to make the Island of Narcondam. If going to the southward, some tacks should be made to keep a good distance from the islands near the coast of Tanasserim, though between them there are some good channels. In going to the Strait of Malacca, after passing the point of Junk Ceylon, make directly for Prince of Wales Island; if to Acheen, if possible make to the west, towards the Nicobar Islands, or keep on the southern tack as far as the coast of Pedir, (coast of Sumatra,) where the current will be

found setting to the W., favorable for reaching Acheen Roads. Take then the Bengal Channel, between Pulo-Way and Pulo-Brasse, for entering the gulf, if bound for Pondichery or the Coromandel coast, and when at sea, take advantage of every variation of the wind to make westing. Some vessels, holding a good wind, have made this passage in fifteen days, during the strength of the S. W. monsoon.

We have described these routes in detail, as they give a general idea of the navigation to be adopted in every season when going from the west to the east coast of the Gulf of Bengal, and *vice versa*. The following will complete these remarks :

Routes from  
the Coromandel  
coast to Mergui  
from March to  
the middle of  
September.

Bound from the ports of the Coromandel coast to Mergui, from the first of March to the middle of September, the winds blowing from W. to S. S. W. make it necessary to pass to the south of the Little Andaman after reaching the parallel of  $10^{\circ} 10'$  or  $10^{\circ} 15'$ . If the Ten Degrees Channel is taken on these parallels, this island can be sighted, when the route toward the east coast will be made with more certainty, making the land about the Torres Islands.

Although it is rare, especially at this season, to find westerly currents, it is prudent, when the Little Andaman is not sighted, to make ninety miles over the reckoning before standing to the northward, to avoid falling in with the island in the night, when it is supposed to have been passed.

Leaving the Coromandel coast, a vessel may also steer for the Sombrero Channel. D'Après considers this an excess of precaution, and that a vessel will be sufficiently to windward by adopting the Ten Degrees Channel.

In the passage from the Andaman Islands to the east coast of the gulf, a vessel is often drifted to the east by the currents; to this attention should be paid. The islands of the Mergui Archipelago are high, and soundings can be obtained well out, which prevents all danger. Having made this archipelago, steer for the Island of Cabosa; in entering the archipelago, a vessel in steering to the eastward may pass either to the north or south of this island, leaving to starboard the Western Canister Island. For the port of Mergui we refer to the special directions.

From Mergui  
to the Coroman-  
del coast.

From Mergui for the Coromandel coast a vessel should not leave later than the 15th or 20th of December, so as to arrive on this coast in the first part of January, the season when a vessel may go there with perfect safety.

The N. E. monsoon being at this period in full force, on quitting Cabosa Island steer to pass between Preparis and the Cocos, or between the latter and the Great Andaman; from there steer toward the Coromandel coast, taking care to make the land to the northward of the port of destination.

N. E. monsoon.

If Mergui is not left before the first fifteen days of February, the most certain route to the Coromandel coast will be to pass to south of the Little Andaman, taking advantage at this season of the winds, which, in the Gulf of Bengal, are more frequently from the southward than from the northward.\*

When Mergui is left during the S. W. monsoon for ports of the Gulf of Bengal, Acheen, or the Strait of Malacca, the route followed is nearly the same as that from Rangoon to these ports during this monsoon.

S. W. monsoon.

The most favorable time for the passage from Pondichery or Madras to Acheen, is to leave between the 15th of August and the 15th of September; that is, toward the end of the S. W. monsoon. During this monsoon, and particularly between the 15th of August and the 15th of September, says D'Après de Manneville, a vessel after getting to seaward will meet the winds from W. S. W., variable to S. S. W., with which the Island of Sumatra should be made, about the parallel of 5° N., to windward of the Surat Passage, which, although the narrowest, is the best in going to Acheen.†

Route from  
Pondichery or  
Madras to  
Acheen.

Captain Carnegie says that when leaving Pondichery or Madras during the S. W. monsoon, he believes it preferable, in going to the Strait of Malacca, to pass through the Ten Degrees Channel than to keep to windward to approach Cape Acheen.‡

Strait of Malacca.

During the N. E. monsoon, and at its commencement, the same captain remarks that, on leaving Pondichery or Madras, Sumatra should be sighted to the southward of Cape Acheen; then take the Surat or the Bengal Passage, according as the vessel may be bound to Acheen or to the Strait of Malacca; then work near the coast of Sumatra as far as Diamond Point, and from this point steer for Prince of Wales Island.

N. E. monsoon.  
Route from  
Pondichery or  
Madras to  
Acheen and Malacca Strait.

\* D'Après de Manneville.

† Instructions for the Navigation of the East Indies.

‡ Instructions for the Bay of Bengal, the Coromandel coast, and Strait of Malacca.

Toward the end of the N. E. monsoon, or after the 15th of February, when the S. winds commence near the land, it is advantageous to make northing along the Coromandel coast; then run to pass between Cape Negrais and the Great Andaman, or through the Duncan Passage between this island and the Little Andaman. In these passages, says D'Après de Manneville, northerly currents are seldom found, and most frequently the differences are to the southward; it is then safer, when observations are not obtained, to make an allowance for easterly set, and to look out for the land before it is approached by the reckoning.

S. W. monsoon.  
Route from the  
Strait of Malacca  
or Acheen to  
Bengal.

Leaving the Strait of Malacca or Acheen, during the S. W. monsoon, for Pondichery or Madras, a vessel should keep on the north coast of Sumatra, the coast of Pedir, where there are the land and sea breezes, with currents to the W. Cross the road of Acheen, and if the weather is bad, or if necessary, anchor there. From there steer for the Bengal Channel; the Nicobar Islands can easily be passed to windward, and the wind will be favorable for the ports of the west coast of the gulf, and even Calcutta. If going to Pondichery or Madras, and the winds haul to the westward, it will be preferable to make the Coromandel coast to the northward, and tack afterward, near the land, to make the port of destination.

N. E. monsoon.  
Route from the  
Strait of Malacca  
to Pondichery &  
Madras.

Owing to the bad weather which prevails on the Coromandel coast during the N. E. monsoon, it is better not to leave the Strait of Malacca for that coast until about the 10th of December.

From the port of Malacca, a vessel should steer for Pulo-Pera, avoiding the dangers in the middle of the strait, which we do not describe, as it belongs to the local navigation. From Pulo-Pera, bound to Pondichery or Madras, steer toward the Nicobar Islands, and either pass between or to the southward of these islands. Some prefer the Sombrero Channel, and others the Ten Degrees Channel. If going to Masulipatam or Tanore, after leaving Pulo-Pera, a course can be made to pass to the southward of the Cocos Islands; afterward steer for the port of destination, making the land well to the northward, especially in January, to avoid being drifted past it by the current.

From Malacca  
Strait to the west  
coast of India.

When leaving the Strait of Malacca at the end of October and in November, bound to the west coast of India, from Pulo-Pera, steer to pass to the southward of the Nicobar

Islands, and then run to the west to make the coast of Ceylon in the latitude of Aganis; keep along the south coast of Ceylon, and haul up about Cape Comorin.\*

On leaving Ceylon, Pondichery, or ports of the Coromandel coast for the Strait of Sunda, during the S. W. monsoon, as the S. E. monsoon prevails to the southward of the Equator, it is necessary to make as much easting as possible while to the north of the line. Steer to cross it in 93° or 94° E. longitude, and it is probable that with the winds from S. or S. S. W. and the squalls, a southeast course can be made, nearly so as to pass a suitable distance from the islands off the west coast of Sumatra, by making an occasional tack to the southwest. On this route, if the wind hauls to S. E. the currents often run to the N.; however, by taking advantage of the changes of the wind, it will be easy to make to the southeast, as in the vicinity of these islands the winds often haul to S. and S. S. W., while at sea they are found well established at S. E.; it is necessary then to cross the Equator well to the eastward, as already remarked, and to keep a short distance from the coast of Sumatra. Bound to Bencoolen, a vessel should get on its parallel before making for it, passing to the north or south of the Island of Trieste, according to the prevailing wind.

S. W. monsoon.  
Routes from  
ports of India to  
Strait of Sunda.

Bencoolen.

If going directly to the Strait of Sunda, until near its entrance keep off the land, as generally it will be found easier to get to windward there than near the coast. In every season, however, a good sailing ship can go from Bencoolen to the strait and *vice versa*, by keeping near the land. In all seasons when, coming from seaward, it is prudent to run directly for Cape Java if wishing to enter the Strait of Sunda, then keeping a little to the east or west as the entrance is approached, according to the prevailing wind or the drift of the current

When leaving Ceylon, Pondichery, or the Coromandel coast for the Strait of Sunda, while the N. E. monsoon prevails to the north of the Equator, and to the southward of this circle the N. W. monsoon will be found, nearly the same route should then be followed as that already directed for the opposite monsoon, and a vessel should run to the eastward to cross the Equator on the same meridian.

N. E. monsoon.

When leaving Ceylon in October, the period when the N. W. monsoon does not always exist to the south of the Equator

\* D'Après de Mannevillette; *Instructions*, &c.



tor, it is necessary to run closed-hauled to seaward if the wind is N. E., so as to gain some degrees to the eastward before crossing the Equator; from November to March the N. E. monsoon will be found immediately on leaving Ceylon. In December, January, and during a part of February, the N. W. monsoon is generally found quite fresh to the southward of the Equator, and a vessel can run directly for the Strait of Sunda on leaving the southeast part of Ceylon.

S. W. monsoon.  
From India to  
the eastern  
straits.

If leaving India for the straits east of Java during the S. W. monsoon, the route above directed for the Strait of Sunda should be taken, and the S. E. monsoon, will be found to the south of the Equator; it will then be necessary to work to windward, as already stated, to reach the Strait of Sunda; working against the S. E. monsoon, which is very strong in June, July, and August, causing currents also to the W.; it will be necessary to make long tacks to the south at this season, while at the commencement and end of the monsoon the winds are variable.

N. E. monsoon.

In the N. E. monsoon, when leaving the ports of India for the eastern straits, nearly the same route should be taken as when going to the Strait of Sunda. When bound to the straits east of Java, during the strength of the N. W. monsoon, to the south of the line, if not sure of the position, make the Island of Noussabarou, for in November and December the weather is often overcast near the south coast of Java, the winds are strong and the currents run to the E.; if the land is made more to the westward than Noussabarou and running along the coast at a distance of twelve or fifteen miles from it, better weather would in all probability be found than to seaward.

S. W. monsoon.  
From the Strait  
of Sunda to India.  
East coast of  
India.

From the Strait of Sunda, to Pondichery, Madras or the Coromandel coast, during the S. W. monsoon, a course should be steered for the mountain called the Friar's Hood, on the east coast of Ceylon, then going to the northward, the land should be made to the north of the port of destination.

West coast of  
India.

During the same monsoon, when bound to ports of the west of India, run to the west in the S. E. trade-winds and take the southern route between the Chagos and the Seychelles.

If near the Equator in April or October, the period of the change of the monsoons, when the N. W. and N. winds prevail in the northern hemisphere, with the winds inclining to W. and N. W., a vessel can run for any of the ports of

the Malabar coast and reach Mahe. If bound for Bombay, it will be necessary to steer for the eastern part of the Maldives. Should a vessel be several degrees to the west of these islands before arriving at the Equator, it will be preferable in April, or during the last of September, and in October, to pass to the westward of them to reach the latter port.

During the N. E. monsoon, when returning from the Strait of Sunda to the ports of the east coast of India, steer to pass one hundred and eighty or two hundred and forty miles from Hog Island or Cape Acheen, then conform to the directions given in route No. 6. N. E. monsoon.

In the same season, returning from the Strait of Sunda to the west coast of India, cross the line between the meridians of  $81^{\circ}$  and  $82^{\circ}$  E. Near the Equator and to the northward of it, winds are often found from the W. favorable for reaching Point de Galle; traverse the Gulf of Manar and then follow the coast of Malabar, consulting what has been said on the winds and currents near the west coast of India and the navigation on this coast.

We terminate here the directions on the routes in the Indian Ocean, and we believe that they will be found sufficient. By examining these routes and comparing them with the routes direct, the immense advantage derived from steam in this sea can be appreciated.

#### FOURTH DIVISION—THE CHINA SEA AND THE SEAS OF PASSAGES.

The straits from the Indian Ocean to the China Sea are the Straits of Malacca, Sunda, and the eastern straits, Bally, Lombock, Alass, Sapy, Flores, Aloo, Panthar, Ombay. General remarks. We have already given the routes from the Cape of Good Hope to these straits; in the great routes from No. 1 to 8, the six first may be taken for the Strait of Malacca; No. 7 is the route for the Strait of Sunda, and No. 8 for the eastern straits. Having reached the Strait of Sunda or the eastern straits, in going north it is necessary to pass to east or west of the large island of Borneo. The route to China will then depend on the monsoon which may prevail in the China Sea; as a general rule, when sure of arriving with the S. W. monsoon, the Strait of Sunda is taken, passing to the west of Borneo through the Carimata, Gaspar, or Banca Straits, comprised between the west coast of this island, the Islands of Billiton and Banca, and the coast of

Sumatra; this route is the most direct for China during this monsoon.

On the contrary, when the N. E. monsoon prevails in the China Sea it is necessary, if not desired to work up the China Sea—which is possible, but very wearing on a ship—to take the eastern straits, pass to the east of Borneo by the Macassar Strait, which leads to the Sea of Celebes; then from this sea go to the north by passing to the east or the west of the Philippines, as the case may be.

During this season the Pitt Passage to the eastward of the Celebes may also be taken, crossing the Moluccas and entering the Pacific Ocean by the Pitt Strait, Dampier or Gilolo Passage, then to the eastward of the Philippine Islands, entering the China Sea by the Strait of Formosa.

Thus, generally, with a favorable monsoon, in the China Sea, it is better to pass to the west of Borneo and with an adverse monsoon to the eastward of it. There are two other routes which may be followed in going to China, the eastern routes by taking Bass's Strait, or round the south of Van Diemen's Land; these routes are the most certain when the Cape of Good Hope is doubled toward the month of September, running to the north in the Pacific Ocean, and entering the China Sea by the Strait of Formosa.

Route from the  
Cape of Good  
Hope to China  
with the S. W.  
monsoon.  
Direct route.

To make sure of the direct route to China, the meridian of the Island of Amsterdam should be reached by the 1st of July, at latest, so as to arrive in China in the month of August.\* We have already given the route as far as the Strait of Sunda, route No. 7.

In entering the Strait of Sunda, it is immaterial whether the Crackatoa or the Princes Island Channel is taken; when through the Strait of Sunda, run to the northward and enter the China Sea by the Strait of Gaspar or Banca, and cross the line in from  $105^{\circ} 30'$  to  $105^{\circ} 40'$  E. longitude.

Inner passage.  
Outer passage.

When entering the China Sea by the Strait of Singapore or that of Banca, the passage west of the Paracels, called the Inner Passage, will be the most direct and the quickest during the months of March, April, and May; but in June, when the S. W. monsoons are established, the Outer Passage passing near the Macclesfield Bank will be preferable.

We will give some details of this last route, which should be taken when the S. W. monsoon is well established:

Route from  
Pulo-Aor to Ma-

Having passed to the east of Pulo-Aor, steer toward

\* Captain Lynn, *China*, vol. iii, p. 100.

Pulo-Sapata, always making allowance for the currents setting to the eastward, which come from the Gulf of Siam, and in the run from Pulo-Aor to Pulo-Sapata may take a vessel many miles to the eastward of her reckoning. Also, on leaving Pulo-Aor run sufficiently to the north to avoid the Charlotte Bank, when it will not be necessary to make easting until the parallel of this bank, about  $7^{\circ} 6'$ , is passed; run then to make Pulo-Sapata.

On approaching this island, if no observations have been obtained, pay attention to the lead in the vicinity of Pulo-Condore and the Catwicks. After passing to the east of Pulo-Sapata at a distance of from twelve to twenty miles, steer so as to sound on the Macclesfield Bank, making allowance for the easterly current, which generally is found during the S. W. monsoon. After striking soundings of the east side of this bank, run for the Grande Ladrone, which should be kept bearing N. or N. by E. when the wind is fresh from S. or S. W. In every season the land to the westward and in the vicinity of St. John should be avoided.

From Pulo-Sapata, toward the middle of September, a vessel should keep well to the eastward after passing to the northward of the banks in the southeast part of the China Sea, and attaining the parallel of  $12^{\circ}$  or  $13^{\circ}$ . In getting to the north it is possible that the winds may be found from N. E. or E. N. E., when it will be necessary to take the tack to the northward and take advantage of the variations of the wind to work to the eastward.

In October the coast of Luzon should be made, and not steer for the coast of China until to north of Cape Bolinao, keeping a good lookout when near the parallel of the Island of Pratas. When near Pulo-Aor later than September, it will be very difficult to make the route direct to Canton, as the currents run strong to the S., and light, northerly winds prevail. Under these circumstances experience has shown that the best course is to run to the eastward, to make the west coast of Luzon.

A good sailing ship can go from south to north along the west coast of Mindoro and Luzon during the whole year, it being only necessary to keep near the coast, to profit by the alternate breezes and the variable winds from the W., which are found from October to April. Thus, on reaching Pulo-Aor or Pulo-Timoan toward the middle of October, the Palawan route should be taken.

**Palawan route.** Leaving Pulo-Aor, steer for the South Anambas, passing to the southward of them, of Low Island, and the Great Natuna; from thence northeastward through the channel between the Louisa and Royal Charlotte Shoals; if the wind is southerly sight Balambangan Island at the distance of twenty-four to twenty-seven miles, but with a steady westerly wind pass it at a distance of about forty-five miles and make the Island of Balbac, which may be passed at any convenient distance, about twenty-four to thirty miles, with a fair wind. With the wind from the eastward, borrow nearer to these two islands, for these winds usually force a strong current through the straits to the westward; steer then for the channel formed by the Half Moon, Royal Captain, and Bombay Shoals, and by the Shoals of Palawan; in passing through this channel a vessel should keep about thirty miles from the land, and use the greatest precaution to avoid dangers. If the wind inclines to the E. after being to the northward of the shoals, pass in sight of the north end of Palawan and the Calamianes Islands, then make Luban or Goat Island, and keep near the coast of Luzon; thus reaching Cape Bolinao, keep some distance from it, on account of the reefs near it, and the currents which sometimes run into the neighboring bay. A vessel having reached Cape Bolinao, will be nearly certain of passing to the eastward of the Pratas, unless prevented by a N. E. gale and strong currents to the W., which frequently occur; it is then prudent to keep in with the coast of Luzon as far as Bajador, to make sure of falling in with the China coast to the eastward of the Lema Islands. In case of leaving the Strait of Balbac when the season is too far advanced to take the Palawan Passage, cross the Sooloo Archipelago and the Sea of Celebes, pass round the north point of the Island of Celebes and enter the Pacific Ocean by passing to the southward of Mindanao; this, which is one of the eastern routes, will be mentioned hereafter.

If going to the Moluccas, when leaving the Straits of Malacca, the same route can be taken; if before the month of September, easting should be made after entering the Pacific, and run down to make the Moluccas through the Gilolo or Dampier Channel; in September, after passing the north point of Celebes, a vessel may proceed to the Moluccas by the channel of this name.

The eastern route to China is adopted when, on coming from the Cape of Good Hope, the meridian of Amsterdam is reached between the 15th of September and the commencement of December; this is route No. 8, leading to the eastern straits.

A vessel from the ports of India bound to China should, if possible, leave in October or in November, so as to be able to return by the customary route before the end of the monsoon. On leaving the ports situated in the north of the Gulf of Bengal, at a season when it is necessary to take the eastern route, she may proceed by Malacca Strait and the Carimata Passage, or to the westward of Sumatra, as circumstances may require. If leaving during the early part of the N. E. monsoon, the route by Malacca Strait and the Palawan Passage, already mentioned, would be preferable to the long circuit of the eastern route. Leaving the Malabar coast, Ceylon, or the southern ports of the Coromandel coast, from Pondichery for example, a vessel should pass to the southward of Java and take any of the straits eastward of it, the Strait of Sunda may equally be taken, then eastward in the Java Sea toward the Strait of Macassar. Leaving the Malabar coast, or the ports of the west coast of the Indian Ocean, the Malacca Strait should not be taken.\*

October and November are regarded as the two most favorable months for passing quickly through the Strait of Macassar; this is the first eastern route. During the other months it would appear more advantageous to adopt the Pitt Passage, and especially from the middle of December to February. We will give this latter route hereafter.

A vessel arriving at the eastern straits in the last half of January or in February takes, generally, the Strait of Lombok; passing to the east of the Island of Banditti, which divides it into two unequal parts, the passage to the westward of this island can likewise be taken, though very narrow; the mid-channel between Lombok and Banditti would probably be preferred, keeping afterwards on the east shore of the strait; from thence steer toward the Macassar Strait, passing to the east of the Island of Hastings and the Little Pulo-Laut, and then shape a course toward the coast of Celebes to enter the Macassar Strait.

If, instead of adopting the strait of Lombok, that of Bally had been taken, with the intention of passing through

\* D'Après de Manneville.

the Macassar Strait, nothing should be made by passing through the channel between the Islands of Pondy and Galion; then giving a good berth to the western extremity of the Kalkoon Islands and Shoals, steer to pass on either side of Little Pulo-Laut, as the winds may render advisable. If from Allass Strait, steer to make the Island of Hastings and pass it to the eastward, as when coming from Lomboek.

A vessel from the Strait of Sapy, during the same months, may pass either to the eastward or westward of the Postillions, as winds or other circumstances may render advisable; then proceed to the northward between Tanakeka and the Tonym Islands, giving afterwards a berth to the Spermonde Islands and Shoals, which are northwest from the Bay of Macassar, and enter the strait, keeping along the coast of Celebes; on leaving the strait, when off Cape Dundas in March or April, it will be necessary to cross the Sea of Celebes and make for the east extremity of Bassilan.

In steering for the Bassilan Channel, between the island and the western part of Mindinao, care must be taken to keep well to the eastward, if the winds permit, so as not to be drifted by the westerly currents among the islands of the Sooloo Archipelago; if falling to leeward good channels will be found between the islands to the westward of the Sooloo Archipelago; then cross the Sea of Mindoro, keeping near the coast of the Philippine Islands—Mindinao, Negros, Panay, Mindoro, and Luzon. At the entrance of the channel between Mindinao and Negros, as also between Panay and Mindoro, currents from W. and strong winds from N. E. are generally experienced; it is necessary, then, when passing from one island to another, to make allowance for the currents, so as not to fall to leeward.

If on leaving the Strait of Bassilan the winds from S. W. to S. are well established, steer direct for Point Naso, keeping a little to the eastward of its meridian; if the winds are variable and uncertain, keep along Mindinao as far as Point Galera, then cross to Point Naso, endeavoring to approach the Island of Negros in going from one point to the other. From Point Naso stand to the northward along the west coast of Panay, keeping a lookout for the dangers off this coast; round the islands near the southwest point of Mindoro and enter the channel either east or west of these islands and the Bank of Apo. Entering this channel with the wind at E., keep six or nine miles from the coast of

Mindoro; when the wind is from the W. the coast should not be approached nearer than nine or ten miles until north of Apo Banks, thus clearing the Strait of Mindoro; after rounding Point Calivite and passing Luban and Goat Island, follow the coast of Luzon as far as Cape Bolinao. Having arrived at this cape, the passage to the eastward of the Pratas Shoal to Macao is nearly certain; however, it is more prudent to go to the northward as far as Cape Bojados before crossing to the coast of China. At this season, also, on arriving in the Sea of Celebes, the Pacific Ocean may be entered by passing to the south of Mindinao.

In this case, if the wind permits, steer directly for the Serangni Islands; pass between these islands and Mindinao, or to the southward of the former; from thence between Meangis and Tulus Islands, so as to double with the N. E. winds the north cape of Mortie; if it is found difficult to make this route the channel between the Tulus and Sanguir Islands can be taken, then keeping to the east.

When coming from Macassar Strait, having passed between Siao and Tagolanda, or through one of the channels in the vicinity of Sanguir, it is necessary to keep to the eastward, to double at a good distance the north cape of Mortie; for the same reason vessels passing to the south of Siao should run to the northeast, if the winds permit. Having entered the Pacific Ocean keep off from the Philippines and pass to the west of the Pelew Islands, then stand to the northward and enter the China Sea by the Strait of Formosa.

The Pitt Passage, which, as already stated, enters the Pacific Ocean by the Straits of Pitt, Gilolo, or Dampier, is preferable to the Macassar Strait during December, January, and February. On arriving at this period, whether at the Strait of Sunda, in coming from Bengal, or at the eastern straits, from the Cape of Good Hope, it should be adopted in going to China; this is the second eastern route. If, as is frequently the case when coming from the Gulf of Bengal, a vessel passes through the Strait of Sunda instead of passing along the south coast of Java on leaving this strait, she should pass to the northward of the Thousand Islands, and steer to the eastward in the Java Sea on leaving the North Watcher, to reach Salayer Strait. Having stopped at Batavia, on leaving this port, after passing the Island of Edano, steer to pass well to the north of the Island of Burakin, and

Second eastern route to China with the N. E. monsoon, December, January, and February, by the Pitt Passage.



having doubled this island, keep toward the Strait of Salayer.

With the wind from the N. W., the best route to traverse this strait is to pass to the southward of the Mansfield Bank. During the night, or when the winds are uncertain, it is preferable to pass to the northward of it, keeping along the coast of Celebes; from the Strait of Salayer steer for that of the Bouton, or, which is better, if the wind is W. pass to the southward of this island, running near its southeast point, so as to keep clear of the reefs which lay round the Island of Toukan-Bessy, to the southward, then run up along the east coast of Bouton Island, and on reaching its northeast extremity, if the wind is very fresh from N. W., keep to the northward toward the Island of Weywongy, and from there for Xulla-Bessy. This precaution is indispensable for ordinary sailing vessels in December and in the first part of January, for the winds often vary, and at this period haul to N. N. W., producing southerly currents; the winds and the currents are, moreover, very variable in the Pitt Passage, and it can be crossed anywhere; it is, nevertheless, prudent to keep always on the weather shore if the winds prevail from the N.

In case of falling to leeward of the northwest point of the Island of the Bouro, every exertion should be made to double it quickly. In this case instead of working to windward to accomplish it, it will be preferable to run to the southward along the coast of this island, and pass to the eastward of it to enter Pitt Strait. During the N. W. monsoon vessels leaving Amboyna keep to the northward, near the east coast of Bouro, where the winds are variable, with squalls from the land, where strong currents are seldom met, and sometimes even they are favorable in going to the northward, while near Manipa and in the channel which separates it from Ceram, there are at this season southerly currents. Having arrived by these routes in the Pitt Passage, be governed, then, by the following directions:

If the Strait of Bally, of Lombock, of Allass, or of Sapy is taken to reach the Pitt Passage, on leaving either of them steer for the Strait of Salayer, crossing the east part of the Java Sea, and navigate afterward for Pitt Passage, as already directed.

Coming from the Cape of Good Hope, the Strait of Ombay should be taken in preference, as it is the most direct,

larger than those to the westward, and the winds are in general less variable. When approaching this strait a vessel may pass either north or south of Sandalwood Island; it is more advantageous, however, to pass to the southward of it, and then steer between Ombay and Timor. After turning the eastern extremity of the first of these islands, run to the north, hugging the wind to pass to the west of Bouro Island; if unable to do so, pass to the east between it and Manipa, and enter the Pitt Passage.

When in the Pitt Passage, keep to the eastward to pass between Xulla-Bessy and Bouro, in case of having passed to the west of the latter; from thence, if there is no current, steer directly for Pitt Strait; if the current sets to the N., the islands on the northern shore of the passage should not be approached.

When near the meridian of the east point of Oby-Major, and wishing to take the Dampier Strait, continue to the east; this strait appears to be favorable for good sailing vessels, and particularly in January and February, when the N. E. winds approach the Equator. In March, when the N. E. winds grow lighter, the Gilolo Strait would be preferable for entering the Pacific Ocean. The latter is, besides, larger, and a vessel can work to windward there by night as well as during the day, and the currents there are seldom strong.

On leaving Pitt and Dampier Straits, the greatest caution should be used to prevent drifting toward the north coast of New Guinea, and a vessel should manage so as to double close round Point Pigot, avoiding the Buccleugh Bank to the east of the eastern coast of Waigiou.

Pitt Strait should only be taken when constrained to do so. Then, keep in mid-channel to avoid being drifted on the land by the tides, making short tacks, without approaching the shores of the strait. Strive thus to reach Jackson Island, and pass about five miles to the northward of it. After passing the reef off the extremity of the Island of Barenta, run to the north toward Point Pigot. Horsburgh advises to avoid this strait if possible.

To take the Dampier Strait, on leaving the meridian of the east point of Oby-Major, run to the east to pass between Pulo-Popo and the Kanary Islands. Vessels then, sometimes, pass between the Boo Islands and Pulo-Popo; this channel is advantageous with the wind from the N. W. Steer then for Fisher Island, or Cape Mabo, and from this cape to pass

between Pigeon and Foul Islands, looking out well for the dangers along the northern coast of Dampier Strait. In leaving it keep closer to Pigeon than to Foul Island, and shape a course sufficiently close to Point Pigot to avoid being set toward the coast of New Guinea by the swell from the northward in the Pacific. It is necessary always to avoid the Buccleugh Bank.

Tides in the  
narrow part of  
Dampier Strait

The tides are very strong in Dampier Strait, and the currents very irregular, their velocity varying from one to five miles per hour. During the strength of the N. W. monsoon, in the narrow part of the strait between Pigeon and Foul Islands, the ebb at full and change runs from four to five miles to the E. N. E. for six or eight hours, and from one to three miles during the ordinary tides. The flood runs to the S. W. for three or four hours, but it is weak. During the strength of the S. E. monsoon, in this locality, the flood sets to the W. for eight or ten consecutive hours, turning successively to W. S. W., to S. W., and S. W. by S., where it attains its greatest velocity, which, at the period of the syzygies, is often more than five miles per hour, and is reduced to four miles at neap tides. The ebb, at this period, runs to the E. N. E. or to the N. E., and is neither rapid nor of long duration.

From Dampier  
Strait to Formosa  
Channel and  
China.

On leaving Dampier Strait, when in the Pacific Ocean, make to the eastward, keeping between the parallels of  $10^{\circ} 30'$  and  $30^{\circ}$  N., which can be easily done. Sometimes, even in December and January, currents are found in this zone setting to the eastward. These are mentioned in the *General Examination of the Pacific Ocean*.

Thus, make easting, to pass to the east or west of the Pelew Islands, according to circumstances. This will depend on the qualities of the vessel, and the strength of the N. E. monsoon. A vessel should not under any circumstances go far enough to the east to risk making the islands of Goulou and Guap, near which, in November and December, there are, at times, heavy squalls from the W. From the Pelew Islands steer to make the Bashees, making allowance for the current setting to the westward, with a velocity of from twelve to fifteen miles per day. From December to the middle of February, it will, on this account, be prudent to pass to the eastward of the Pelew Islands. If Dampier Strait is left toward the end of the N. E. monsoon, a vessel should not run so far to the eastward in the Pacific Ocean.

At the end of February and of March, the passage may be made to the westward of the Pelew Islands, as the winds, at this period, often turn to the E. N. E.

On reaching the northern part of Luzon, enter the China Sea by the Balintang Channel, or those formed by the Bashee and Babuyan Islands. However, with the wind from N. E. at the commencement of the monsoon, it will be necessary to pass to the north of the Bashee Islands, and to the north or south of the Gadd or Cambrian Rock. On approaching the south point of Formosa, if by day, with fine weather, pass between it and the Vele-Rete Rock. During the night, or if bad weather does not permit this route to be taken, pass to the north of the Bashee Islands, keeping close to them.

By whatever channel the China Sea is entered, if possible, a course should be made to sight Ty-Sing-Cham, or Pedro-Blanco, and enter Canton River by the Lema Channel.

We will now speak of the Gilolo Strait, the third of those leading from the Pitt Passage to the Pacific Ocean.

The Strait of Gilolo is divided into two parts by the Island of Geby. That part between this island and Gilolo is called the Gilolo Strait. That between Geby and Waigiou has retained the name of Bougainville, who passed through it in 1772.

Gilolo Strait

All the channels which conduct from Pitt Passage to the Strait of Gilolo are exempt from dangers. That between Pulo-Gass and Kekek is preferred, however, during the N. W. monsoon, as being the largest. The other large channel, between Pulo-Pisang and the Boo Islands, is, at this season, too much to leeward. In entering the Strait of Gilolo, passing, as before mentioned, between Pulo-Gass and Kekek, a vessel should turn very near the southern point of the former, so as not to miss the channel by the drift of the currents to the eastward, which often prevail here. After having passed to the east or west of Pulo-Gass, according to the channel adopted, steer to pass between Cape Tabo and the Island of Geby; if at night give a good berth to Fairway Bank and the Widda Islands. It is prudent, however, when the winds are light, to keep as near as possible to the islands on the western shore of this channel, on account of the currents setting to the N. E. and E. If the wind is contrary, time should not be lost in attempting to pass to the north of Geby. Go, then, to the south of it, between it and Gagy

Island, and enter the Pacific Ocean by one of the channels near Syang. But whenever they can be taken, the west channel, between Gilolo and the Shanpee Islands, and that between these islands and Syang, are preferable, as they permit a vessel to pass to windward of the Islands of Ayou and Asia, with winds from the N.

If there is any difficulty in passing to the west of the Asia Islands, the channel between them and Ayou, or even that between the latter and the north coast of Waigiou, may be taken.

When in the Pacific Ocean, get as soon as possible between the parallels of  $1^{\circ} 30'$  and  $3^{\circ}$  N., to make easting. There the currents will probably be found S. and S. E., and by not passing to the north of the parallel of  $3^{\circ}$  N., the last part of the route will be reached, as has been already given from the Dampier Strait to Formosa and the coast of China. We have described the eastern routes at some length, as they give a general idea of the navigation of the seas of passages, and show how the different channels can be followed, according to circumstances. These are the two routes for China, the most frequented during this season.

The following route may also be adopted during the same season, when coming from Europe, and is the most certain that can be taken when leaving the meridian of the cape in September. It is called the great eastern route to China.

Great eastern  
route from the  
Cape of Good  
Hope to China.  
N. E. monsoon.

From the meridian of the Cape of Good Hope steer to the eastward, keeping between the parallels of  $38^{\circ}$  and  $40^{\circ}$ , or thereabouts, as far as Cape Leeuwin. From thence there are two routes, that to the south of Van Diemen's Land, and that through Bass Strait.

First route to  
the south of Van  
Diemen.

The first route was made by Captain Butler, of the ship Walpole. He left the Cape of Good Hope at the end of September; the 31st of October he sighted the southwest point of Van Diemen; the 18th of November he sighted the Island of Anno-Bom, one of the New Hebrides. Passing these islands at a short distance to the west, he crossed the Equator to the west of the Island of Paanopa, in longitude nearly  $161^{\circ} 40'$  E.; the 21st of December he passed through the Caroline group, and afterwards the Mariannas. The 30th he entered the Formosa Channel, and the 1st of January arrived at Macao. Thus the voyage occupied three months, only a little longer than the time generally taken in the direct route during the favorable season.

Two months is regarded as a fair mean from the Cape of Good Hope to the Strait of Sunda, and generally three weeks from there to the Canton River.

Instead of passing to the south of Van Diemen's Land, the route through Bass Strait is oftener taken. This route was followed in 1804 by the frigate *Athénienne*. She passed Amsterdam Island the 11th of October, and entered Bass Strait the 28th of October, passed to the west of New Caledonia and the Hebrides and between these and the Salamon Islands. She crossed the Equator in 160° E. longitude, and arrived in sight of the coast of China the 28th of December.

Second route  
by Bass Strait.

Notwithstanding this, and although this route is much shorter, Admiral Krusenstern gives the preference to that to the south of Van Diemen, and assigns as a reason that the westerly winds can be more calculated on in the higher latitude, and that in passing to the south of Van Diemen, the winds from N. are avoided, as also the currents setting to the S., which are often found at the entrance of Bass Strait. The length of the voyage from the English Channel to Canton is as a mean from five to six months.

#### RETURN ROUTES.

We will now give the return routes from China to Europe and India.

In returning from China to Europe the principal object is to gain as quickly as possible the zone of the S. E. trades, with which the westing is made, and the Cape of Good Hope soon reached. In returning from China to India, a vessel should strive to reach the Strait of Singapore as quickly as possible, so as to pass through the Strait of Malacca. We will give these routes for both monsoons.

When leaving China during the N. E. monsoon, bound to Europe or to India, steer for the Straits of Banca and Gaspar or toward the Strait of Singapore. In March and April the most expeditious route will be the outer passage, leading in the vicinity of the Macclesfield Bank; during these two months a vessel should keep out to sea as far as the latitude of Pulo-Sapata.

Return from  
China.  
N. E. monsoon.

During the other months, on the contrary, the inner passage should be taken, between the Island of Hainan and the Paracels. Thus the Straits of Singapore, Gaspar, and Banca should be reached without difficulty. From the two

latter steer for the Strait of Sunda; leaving this strait, the parallel of  $10^{\circ}$  N. latitude may be crossed in  $102^{\circ}$  E. longitude, when steer directly for the south point of Madagascar, when one of the routes No. 11 or 12 can be taken. This route crosses the central part of the zone of hurricanes, so that these tempests are more generally encountered on the return from the eastern seas.

We will give some of the details of the interior and outer routes, which will be most useful to those not well acquainted with this navigation.

Interior route  
from Macao to  
Pulo-Aor.  
N. E. monsoon

The interior route is the most direct that can be made to the straits leading out of the China Sea; it presents, beside, this advantage, that vessels can run with the winds aft after passing the Great Ladrone. When this route is taken, on leaving the Great Ladrone, steer to pass near the Islands of Faya, and to pass a convenient distance to the west of the Paracels. The current is estimated as setting from the W. from fifteen to twenty miles per day. Near the coast of China the currents are strong, while to seaward they are often weak. If a strong westerly drift is found a course should be made, allowing for this current as far as the parallel of  $17^{\circ}$  N., and until within the channel between the Paracels and the coast of Cochin-China; when upon the above-mentioned parallel and on the meridian of  $110^{\circ} 40'$  steer to make Cape Varela or the pagoda.

With clear weather and winds from E. N. E. or N. E. Pulo-Canton (called, besides, Callao-Ray) may be approached, or any part of the coast to the southward of this island may be made and coasted along at a moderate distance; if the weather is cloudy and the wind has a tendency to the eastward, it will be prudent not to approach the coast until in the latitude of Cape Varela, so as not to penetrate into the Bay of Phuyen, situated to the north of this cape. In case the Conical Mountain, which rises on the north shore of this bay, is visible, it will serve to indicate the position of the cape, if, toward night, the pagoda should be hid by the clouds.

When to the south of the parallel of  $15^{\circ}$  N., near the land, the currents will be found commencing to run to the S., and between  $14^{\circ} 30'$  and  $11^{\circ} 30'$  they have often a velocity of forty, fifty, and even sixty miles per day; they are, however, very variable.

Sighting Cape Varela is indispensable when the land has

not been seen to the northward of it. Afterward run along the coast, keeping it twelve to fifteen miles distant.

When east of Cape Varela, approach it to within four or five miles, and during the day run along the coast; by night it is necessary to shape a course to give a good berth to Pyramid Island and those around it; in a clear night Pyramid Island may be sighted, by passing a few miles from it; steer then to pass near the Water Islands, which are about twenty-one miles further south; these may be seen in passing. On passing these islands, should the land appear to be more than twelve miles off, it will be necessary to approach it to get sight of the False Cape Varela, which can be distinguished from the other high land of the coast by its greater magnitude and its sloping toward the sea with a gentle declivity.

If intended to keep along the coast, and to pass to westward of Holland Bank, cross Padran Bay when abreast of the southern part of the high land of Cape Varela; this is necessary, as the currents in this locality take the direction of S. S. E., drifting a vessel off the land, which it would be found difficult to regain. If not too far out, in crossing the Bay of Padran, soundings will be obtained in from forty to fifty fathoms; then, during the night, if not very dark, Cape Padran will be seen ahead, or a little on the starboard bow, and it cannot be mistaken, for the land in the bottom of the bay cannot be seen at night.

When the cape is seen pass it at a distance of from three to six miles, and steer to pass outside of Pulo-Ceicer de Terre the same distance.

By day, having passed this island four, five, or six miles, steer to bring it to bear N. by E.  $\frac{1}{2}$  E. before losing sight of it; then make eighteen or twenty-one miles between W. S. W. and S. W. by W., which will lead clear to the westward of Holland Bank; then run for Pulo-Aor.

This route can be followed with safety when the night is sufficiently clear to discern the Gap of Padran, in which case, being three, four, or five miles from the cape, steer a suitable course to open the gap, and when it bears N. by E. Pulo-Ceicer de Terre is coming on with it, and if then the soundings are ten or eleven fathoms, keep out a little, as the island is low and should not be approached near enough to see it at night, and the soundings in this part of the channel are too irregular to serve as a sufficient guide. When



the gap bears N. 16° E., Pulo-Ceicer de Terre is on with it; when, by making eighteen or twenty miles between W. S. W. and S. W. by W., the west end of Holland Bank will be cleared, when shape a course for Pulo-Aor.

If the night becomes dark, so as to obscure the land and the gap, when abreast of or near Cape Padran, a course should be made to the southwestward until thirty-six or thirty-nine miles from the cape, hauling off from Pulo-Ceicer de Terre on the coast; if the water shoals to eleven fathoms, and do not deepen the water above twenty or twenty-one fathoms toward Holland Bank. From the west end of this bank the nearest edge of Britto Bank is distant forty-two to forty-five miles, affording a large channel for passing between them in the night. To keep in sixteen or eighteen fathoms is a good track from Pulo-Ceicer de Terre until fifteen or eighteen miles past it; or if thirty-six to thirty-nine miles to the southwestward of Cape Padaran, it will be well to run to the southwestward six or nine miles further, to be certain of giving the west end of Holland Bank a good berth; the water should not be deepened above twenty-one fathoms until clear of it, nor decrease the soundings under seventeen fathoms toward Britto Bank, in running far to the westward; from twenty-one to nineteen fathoms are good depths in the channel between these banks, and having rounded the west end of Holland Bank twenty and twenty-one fathoms in steering toward Pulo-Aor.

The route between Pulo-Ceicer de Terre and the Holland Bank cannot be taken during the night by those unacquainted with it; therefore, a vessel may be obliged to heave to off Cape Varela to await daylight, thereby losing much time and laboring in a heavy sea when the breeze is fresh; from this the preference is generally given to the route outside of Pulo-Ceicer de Mer and Pulo-Sapata.

Route outside  
of Pulo-Sapata.

If near False Cape Varela toward night with a wind that would render it disagreeable to lay to, or with bad weather, when it would not be desirable to run between the Holland Bank and Pulo-Ceicer de Terre, steer to pass to the east of Pulo-Ceicer de Mer and Pulo-Sapata on the following morning; or if the weather is dark run more to the eastward, to pass a good distance from these islands; in fact, when the wind is strong the currents run to the S. W. and W. S. W with great velocity, and vessels may be set down toward

Pulo-Sapata and forced to pass in the night between it and the Little Catwick.

By day, with good weather, Pulo-Ceicer de Mer can be passed as close as desired, and a course shaped to pass between Pulo-Sapata and the Great Catwick, and even between the two Catwicks, care being taken to give a good berth to La Paix Rock in the channel between these two islands; from thence steer for Pulo-Aor. When near Pulo-Timoan with thick weather, keep in thirty-two or thirty-three fathoms of water, to pass to the eastward of this island for Pulo-Aor; as they are sometimes enveloped in clouds or mist, care must be taken not to run on them in the night. Near the Anambas, and to the northward of them, the depths are generally forty and fifty fathoms to latitude  $5^{\circ}$  and  $5\frac{1}{2}^{\circ}$  N., decreasing on the west side of the channel to thirty-five and thirty near the meridian of Pulo-Timoan.

Having passed to the east of Pulo-Aor from six, nine, to twelve miles, if bound to Banca Strait, steer to the southward and eastward, according to the prevailing winds and currents, to pass outside of Geldria Shoal, which will be avoided by not coming within twenty-three or twenty-four fathoms in crossing from  $0^{\circ} 40'$  to  $0^{\circ} 56'$  N.; after passing it, steer to cross the Equator in twenty fathoms, and pass twelve or fifteen miles off the east point of Lingin. Care must be taken that the westerly current, which sometimes prevails, does not set the vessel toward the Ilchester Shoal, lying to the southward of that point.

When abreast the east point of Lingin about fifteen miles distant, steer to pass between Pulo-Taya and the Seven Islands; having passed through this channel, steer for Batacarang Point, forming the west side of the entrance to Banca Strait; this point should be approached to six and one-half or seven fathoms to avoid the Frederic Hendrick Rocks.

On leaving Macao, if the outer passage is to be adopted, pass at a moderate distance to the westward of the Ladrone and adjacent islands. When the wind is strong with a heavy sea and a leeward current, it is necessary to steer to the southward and eastward from the Great Ladrone to get soundings on the Macclesfield Bank. When the wind is moderate steer for the east part of the bank, but if over sixty miles to eastward of the meridian of the Great Ladrone, the obtaining soundings will be doubtful, as in that case the vessel will probably be to eastward of the bank.

Route from  
Pulo-Aor.

Route to the  
Strait of Banca.

Outer route,  
Macao to Pulo-  
Aor.

If the outer route is taken in November and December, with a very fresh wind, and observations not obtained for several days, soundings should be got on the Macclesfield Bank; but with the position well determined it is useless to sound there; as the bank has a great extent from east to west and the soundings are irregular, only an approximation to the position can be obtained from the soundings. Leaving Macclesfield Bank steer for Pulo-Sapata; but if soundings have been obtained on this bank or when in its latitude, it will be better to steer a little more to the southward until on the parallel of Pulo-Sapata, then if it is not seen steer to the westward until in thirty-five or thirty fathoms water. With thick weather, when the position is uncertain, it is dangerous to run direct for Pulo-Sapata, or pass the island in the night, as it can not then be seen. At such time it is generally given a wide berth by keeping well to the eastward, until the parallel of  $10^{\circ}$  N. is crossed, then steer to the southward and westward to get soundings. Some vessels run from the Macclesfield Bank well to the eastward, until nearly in the latitude of Pulo-Sapata; this is proper in March, April, and May; but in following the route a good lookout must be kept for the southeasterly currents, which may set a vessel in sight of the banks to the east and east-northeast of Pulo-Sapata.

Having reached the parallel of  $10^{\circ}$  N. steer to the southward until in thirty-five fathoms, then for Pulo-Aor, or if bound to Singapore for Pulo-Timoan; in crossing latitude  $7^{\circ} 6'$  N. do not deepen the water above thirty to thirty-two fathoms, in order to avoid Charlotte Bank.

In March and April vessels returning to Europe should keep well to the eastward to pass between the Natunas and Anambas Islands, and take the Strait of Gaspar.

Route from  
China to the Gulf  
of Bengal.  
S. W. monsoon.

It was long considered impossible to traverse the China Sea against the S. W. monsoon; with a good ship this can always be done by taking the inner passage to westward of the Paracels. Leaving the Great Ladrone with the wind from E. to S. E., which is quite frequent there and lasts for several days; if bound to Bengal, the passage would be shorter by the Strait of Singapore than by taking the eastern routes and following the coast of Luzon, of which we will speak hereafter. In this case a vessel should keep a short distance from Hainan and the coast of Cochin-China; but not so near as to be subject to the influence of the currents to the N. N. E. which run along the coast, and not so

far in the offing as to lose the advantage of the variations of the breeze and the smooth sea in the offing; besides, the winds are frequently from S. and S. S. W.

This route is only suitable for vessels returning to the Gulf of Bengal by the Strait of Malacca; and in some years it is attended with much difficulty. Vessels going to the west coast of India or to the Cape of Good Hope should not take it, if the wind is found ahead at the entrance of Malacca Strait, as great difficulty would be found in passing through it, and they would continue to be thwarted by the winds from the time of passing Acheen Head to the trade-winds, an extent of  $12^{\circ}$  to  $14^{\circ}$  of latitude.

In May or June, a vessel should not make to the southward for the Straits of Gasper, Banca, or Carimata.

With the S. W. monsoon, when leaving Canton for Europe or the west coast of India, it appears to be most prudent to take one of the two routes to the eastward, according to the time of leaving China, during the S. W. monsoon.

On leaving Macao or the Great Ladrone, at the end of April or commencement of May, with the intention of taking the first route to the east, that is, the Strait of Mindoro, steer towards the south as far as the Macclesfield Bank, if the wind permits, so as to reach the northwest extremity of Mindoro without tacking, in case the winds haul to S. W. When in the vicinity of the Macclesfield Bank, steer to the southeastward, hugging the wind if it is from S. W., and if it does not permit Point Calavite to be passed, work to windward near the coast of Luzon, with the variable winds with which the northwest point of Mindoro can be reached.

First route to the east.  
From China to the west coast of India and Europe.  
April and beginning of May.

In crossing the Mindoro Strait take the channel to the eastward of the Apo Bank, keeping a few miles from the coast of Mindoro if the wind is variable, and at about nine or ten miles if the S. W. wind is well established, and pass the Islands of Ambolon and Ilin, at a distance of about fifteen miles.

Mindoro Strait.

Should the winds permit, the Strait of Mindoro can be crossed by passing to the westward of Apo Bank, through the Northumberland Channel, which is between this bank and the Calamianes Islands. Then run along the coast of Panay, or work to windward at a suitable distance from it, as the case may be, and approach the Island of Quinilaban to pass the Dry Sand Bank, between this island and the coast of Panay.

Straits of Basilan.

Having reached Cape Naso, stand for the Strait of Basilan, making it well to the southward and westward, with the winds from the southern or western quarters; if the wind should be from the eastward steer directly for the strait. When off the southwest extreme of Mindanao, it is better to take the Basilan Strait than those formed by the islands to the southwest, the former route being the shortest; enter thus the Sea of Celebes and steer for the Strait of Macassar.

Should there be much difficulty in taking the Strait of Basilan on account of S. E. winds and easterly currents, the following route is given by Captain Spratly, as being easier and more expeditious to the Strait of Macassar:\*

Instead of tacking continually at the entrance of Basilan Strait, run to the southward to pass to the west of the Sooloo Archipelago for Usang Point on Borneo, twenty miles from this will bring a vessel nearly abreast Tawee Island, which is a bold, high island, free from danger, between which and two low islands lying to the southeastward of it and the Island of Sibbotoo, is a fine, clear channel, leading directly into the Sooloo Sea, safe by night as by day. Captain Spratly has passed from one sea to the other in four hours by this channel; while under similar circumstances it has taken him four days by the Strait of Basilan. When in the Sea of Celebes, there is the choice between taking the Strait of Macassar or the Moluccas Passage; some navigators prefer the latter, when the S. E. monsoon prevails to the north of the Equator. In fact, the Strait of Allas is difficult to reach when leaving the Macassar Strait; while by taking the Moluccas Channel the S. E. monsoon is found sufficiently to the E. to allow the choice of either of the eastern passages, but vessels bound to Batavia or to the Strait of Sunda should prefer the Macassar Strait.

On leaving Basilan Strait, if the winds are well established from the eastward, steer to make Cape Donda, bearing about S. S. E. to S., but the winds most generally haul to the westward; as the Macassar Strait is approached with a current frequently setting to the eastward, it is prudent to keep as much as possible to the west to sight Point Kanneeoongan; for, says Captain Spratly, in the vicinity of Cape Rivers, a vessel is often drifted to the eastward by the current which

---

\* *Nautical Magazine*, p. 490, 1851.

sets along the coast of Celebes; and after much loss of time is obliged to take the Moluccas Passage.\*

Having entered the Macassar Strait, keep along the west coast of Celebes and pass to the eastward of the Little Pater-Nosters. A good lookout must be had to avoid the dangers to the northward of Noesa-Seras in passing between these islands and the Great Pulo-Laut. From thence steer for the Strait of Allass, or for one of the straits entering the Indian Ocean.

If bound to Batavia or the Strait of Sunda, after having entered the Macassar Strait, keep to the southward as the winds permit, and pass to the north of the Little Pater-Nosters to approach the coast of Borneo; keep along the coast, looking out for the dangers along shore and off shore in its vicinity, entering thus the Java Sea, Batavia or the Strait of Sunda can be reached without difficulty, and leaving this strait, the Cape of Good Hope and the west coast of India are reached by route No. 12, and those already mentioned.

In this route, on leaving the Strait of Basilan, should the winds and currents be contrary for the Macassar Strait, the Moluccas Channel can be taken; steer then for the islands at the northeast extremity of the Celebes; pass between the Islands of Banca and Bejaren, turn the northeast point of Celebes and steer to the southward for the channel between Lissamatula and Oby-Major, which is the most frequented, or should the wind not permit of its being reached, take the Greyhound Channel, between the Island of Albion and Hammond, (to the west of Xulla-Talyabo.)

When it is found difficult to get to the southward in the Moluccas Passage with indifferent sailing ships, they may keep close to the west coast of Gilolo; keep along this coast and through the Patientia Strait, between Gilolo and Batchian, or through the Strait of Batchian, between the island of this name and those of Farrally and Maregoland.

However, if a vessel happens to be near the northern extremity of Gilolo or Morty during the strength of the S. W. monsoon, it will be better to pass through the Gilolo Channel than through that of Moluccas, as a vessel will generally get more speedily through the former into the Pitt Passage, by which the eastern straits can be reached.

On leaving the Moluccas Passage, the Strait of Ombay can be taken, if desirable, passing near Oby-Major, so as to

Strait of Sunda.

Strait of Ombay.

\* *Nautical Magazine.*

round easily the east coast of Bourou, and pass between this island and Manipa; from there run to the southward in the Banda Sea, where the winds are generally from E. S. E. at this season. On leaving Manipa, try to pass to the east of Ombay, and having crossed the channel formed by this island and the Island of Wetta, follow the west coast of Timor and enter the Indian Ocean between Sinao and Savu. This is the shortest route, at this season, from the Pitt Passage to the Indian Ocean.

Second route to the east, by entering the Pacific Ocean.

Return from China to Europe, or to the east or west coast of India.

Middle of May  
June, July.

The second route to the eastward with the S. W. monsoon, returning to Europe or to the west coast of India, is adopted from the middle of May to the end of July. This route enters the Pacific Ocean, and passing to the eastward of the Philippines, enters the seas of passages by the Pitt Passage. In August it is too late to follow this route, and when leaving Macao at this period it is better to follow the coast of Cochin-China and Cambodia, otherwise to defer the departure until September, if the vessel sails badly.

With the winds from S. to S. W., if going to the eastward of the Philippine Islands, a vessel should leave Macao by the Lema Channel, and keep to the southward to enter the Pacific Ocean, without tacking; take then, in preference, the channel between the Bashee and Babuyan Islands, if the winds are not contrary.

When in the Pacific Ocean, the winds will generally, at this season, be found from S. W., and the currents E. or N. E.; steer to the southeastward to clear Cape Engaño and Luzon, tacking, if necessary, to prevent approaching too near to them; and also, in taking advantage of every shift of wind, do not go to the eastward of the Pelew Island, if it can be avoided.

In proceeding to the southward, the best route is to pass to the eastward of St. Andrew's Islands, Current Island, Mariere, Lord North, and Helen Shoal; if an easterly current is experienced, it will be weak as far as the Pelew Islands, but from 5° to 2° N. an easterly current may be expected in June, July, and August, having sometimes a velocity of thirty to sixty miles per day. It often happens that strong westerly winds carry ships speedily across this current; but light baffling airs predominate, and they are liable to set much to the eastward: to prevent this, a course should be steered to cross this belt as quickly as possible; from the parallel of 2° to the line there is a westerly set, while near

the Dampier Strait there is frequently a current running to the eastward. Having passed eastward of the St. Andrew's Island, keep between the meridians of  $132^{\circ} 30'$  and  $133^{\circ}$  E. if the winds permit, and when in  $1^{\circ}$  N., if the Dampier Strait is to be taken, steer for Point Pigot.

The Gilolo Passage being wider, it is often preferred to Dampier Strait, and there is seldom any difficulty in getting through it into the Pitt Passage. Strait o Gilolo.

If the Gilolo Passage is adopted, from latitude  $2^{\circ}$  N. steer toward the Asia Islands, passing to the northward of them, if the wind permits; if not, pass between them and the Islands of Ayau.

After passing the Islands of Eye and Syang, either side of Geby can be taken; should the weather be bad, the channel west of Geby should be adopted. In passing through the Gilolo Passage keep to the eastward, and enter the Pitt Passage, Pulo-Pisang and the Boo Islands, or between Kekik and Pulo-Gass, according to circumstances.

In entering Dampier Strait, round Point Pigot at a distance of from six to twelve miles, then steer toward King William Island, keeping it to the westward until about nine miles from it, when steer for Pigeon Island, passing two or three miles to the southward of it; then cross the strait, keeping a lookout for the dangers which exist there. On leaving Dampier Strait, work round near to Cape Mabo, so as to pass, if possible, to the south of Pulo-Popo; if not, pass to the north of this island, and enter the Pitt Passage between the Boo Islands and the Pulo-Popo. In the Pitt Passage, keep about mid-channel, inclining a little toward the islands on the south side. Dampier Strait.

When west of Pulo-Popo, and between Ceram and Bouro, the Ombay Passage, or one of those to the westward, can be taken to enter the Indian Ocean.

The Ombay Strait is the most direct, during the S. E. monsoon, of those leading to the Indian Ocean; a vessel will then, if bound to Europe or the west coast of India, fall into route No. 12, or those before mentioned in the third division. If the Straits of Salayer, Allass, or Sapy are taken, a vessel should steer for the northwest part of Bouro, and from there for the northernmost of the islands of Toukan-Bessey, rounding it at a distance of two or three miles, and steer for the Strait of Salayer. Strait of Ombay.



Route for the  
Gulf of Bengal, in  
this monsoon.

From Salayer Strait, if bound to Bengal during the S. E. monsoon, pass near the Great Solombo, leaving the Brill Shoal either to the north or south; steer to give a suitable berth to the shoals off Pulo-Mancap, and pass through the Carimata Passage, then steer for the north end of Banca, and take the Strait of Durian or that of Singapore, for the Passage of the Malacca Strait. It is probable that a quick passage to Bengal may be made by this route.

Strait of Sapy.

The Straits of Sapy and Allass are, in general, adopted when bound to Europe or to the west coast of India. In making for the first of these straits, after passing along the Islands of Salayer to the southward, run toward the northern part of Comodo, and then steer for the Western Channel, between Gilibanta and Goonoug-Apee.

Strait of Allass.

If the Strait of Allass is taken, make Flat Island, and when abreast of it, steer for the strait, keeping a suitable distance from the chain of low islands which border the north-west part of Sumbawa; then traversing the strait, take one of the routes as before mentioned.

Such are the routes most frequented in all seasons in going to and returning from China. It now remains to speak of the special navigation of the China Sea.

Special naviga-  
tion of the China  
sea, with or  
against the mon-  
soon.

The passage north or south in the China Sea is daily made, with or against the monsoon, by the clippers. We take the following remarks from Commander P. J. Blake, commanding Her Majesty's ship *Larne*. To his own observations this officer has added those communicated to him by the captains of these clippers:

As a general rule, vessels beating against or running with the strength of the monsoon up and down in the China Sea should pass to leeward of the Paracel Islands and Shoals as well as of the Pratas, or the Scarborough Shoals, on account of the invariable set of the current to leeward and toward the shoals. An exception may be made in beating up against the N. E. monsoon after reaching  $14^{\circ}$  N., as there is an extent of sea room, and a vessel must be well to the eastward toward Luzon before she can fetch Macao.

N. E. monsoon.  
Descending the  
China Sea.

In running down the China Sea with the N. E. monsoon, from Macao to the Straits of Singapore, Banca, or Gaspar, the direct line mostly adopted is nearly mid-channel between Hainan and the Paracels, keeping rather toward the latter, where a southerly current of thirty to fifty miles per day is usual. Between the parallels of  $14^{\circ}$  and  $11^{\circ}$  N. the current

has been found to reach even sixty miles in twenty-four hours; thence making the coast of Cochin-China about Cape Varela, shape a course to the southward to pass thirty or forty miles to the eastward of Pulo-Sapata. From this island to Singapore the route is direct, giving the Anambas a berth of about forty miles, and, if possible, always make Pulo-Aor. To test the reckoning special attention should be paid to the lead. From Pulo-Aor either of the straits may be easily reached. \*

The following is the route generally taken from Pulo-Aor to the straits east of Java, during the strength of the monsoon.† When about fifteen miles to the east of Pulo-Aor, steer to make the Island of Victory, then run along at a suitable distance to the westward of the Islands of St. Julien, St. Esprit, and St. Barbe; leaving the latter, steer to make Sourouton and Carimata.

If the Carimata Passage is taken, the route by which, at this season, is the most certain for reaching the eastern straits, from Sourouton steer for Pulo-Mancap and enter the Java Sea, by keeping a good distance to the westward and to the southward of the dangers surrounding this island; steer then to make the Carimon-Java, and approach the north coast of Java, pass along this coast as well as that of Madura; in running to the eastward, pass near the Island of Pondy and to the eastward of it; from thence, giving a berth to Minder's Rock, steer for Cape Sedano, at the northern entrance of Bally Strait, and take this strait, passing to the east or west of Gilboan. Carimata Passage.

Some navigators prefer the Strait of Lomboek to that of Bally, it is wider and is reached by the same route.

If the China Sea is to be left by the Gaspar Strait, the Macclesfield Channel, that to the west, is generally adopted. Then, from Pulo-Aor steer for Pulo-Toty, passing to the eastward of it fifteen or eighteen miles, if the wind has a tendency to the N. E. From Pulo-Toty steer for Gas- Strait of Gaspar.

---

\* Horsburgh says that in the months of March and April it is better, in going down the China Sea with the N. E. monsoon, to take the outer route, by the Macclesfield Bank, as being the most expeditious; that a vessel should keep to the eastward on leaving China, and even after passing Pulo-Sapata, as the winds are more favorable than to the westward. He says that for the other months it is better to take the inner route, as indicated also by Captain Blake. The details of this route to the west of Pulo-Sapata have already been given.

† D'Après de Manneville. *Instructions*, p. 323.

par Island, and, having made it, pass either to the east or west of it, and round the west coast of Pulo-Leat at a distance of about two miles, leaving to the eastward Vansittart Shoal and Dordelin Rock, which are in the southern part of the strait; enter the Java Sea and make for the eastern straits, as before directed.

**Strait of Banca.** The preceding instructions are principally applicable to ships leaving China at the commencement of the N. E. monsoon, and for leaving the China Sea, the Strait of Banca is adopted in preference to the two former. In this case, make Pulo-Taya and try to pass to the westward of it, to steer afterward for Batacaran Point and toward the peak of Monopin or Banca, at the entrance of the strait.

At the end of the N. E. monsoon, it will be preferable, instead of making Pulo-Aor, to make the North Natunas, for at this period the winds are often from S. S. W., varying to S. E. and E. If, then, from the Northern Natunas the vessel is bound for the Gaspar Strait, pass about fifteen miles to the westward of the Great Natunas and west of the Haycock; then round to the eastward of Victory and Barren Islands, and to the west of Camel, St. Julien, and the Islands of St. Esprit, if the wind permits; if not, take the passage which may be the most convenient between these islands. From the St. Esprit group, steer for St. Barbe, passing to the west of it about nine miles; then run for Gaspar Island, pass about one or two miles to the eastward of it, and afterward run along the west coast of Pulo-Leat and enter the Java Sea by the Macclesfield Channel.

If, at this season, headwinds are apprehended, before entering the Gaspar Strait, steer for the northwest point of Bililiton, round the islands off this point at a good distance, then west of the coast of Long Island; and from thence, avoiding the dangers in Clement Channel, leave this channel between South and Selle Islands, and pass to the east of Vansittart Shoal and Dordelin Rock for the Java Sea. At this period, on leaving the Strait of Banca or Carimata, the Strait of Sunda is the most direct for entering the Indian Ocean.

**S. W. monsoon.** In going from south to north in the China Sea during the S. W. monsoon, the outer passage should be preferred; that is, to the eastward of the Paracels, toward the Macclesfield

Going up the  
China Sea.

Bank, where the sea is free from dangers. In this monsoon the winds hang to the southward, varying from S. S. W. to S. S. E. during the strength of the monsoon, June and July, although some directions, Horsburgh among others, recommend the passage to the westward of the Paracels and near the coast of China. I think, says Captain Blake, that it should not be taken.\* For, he says, in this route the passage taken is narrow, and, at times, there is a risk run of being drifted by the currents on the northwest part of the Paracels. Many vessels have been lost on the shoals in this locality,† from the N. W. winds coming out of the Gulf of Tonkin, and northerly currents. During the S. W. monsoon, in passing through the channel between Hainan and the Paracels, if the weather is overcast, it will, besides, be found very difficult, with currents variable both in force and direction, to shape a course with sufficient precision to navigate with security.

Horsburgh advises the inner route, in case a ship is weak or making much water, as most of the time the land can be kept in sight. Then leaving Pulo-Aor, a vessel should steer along the coast to the Redang Islands, cross the entrance of the Gulf of Siam by Pulo-Oby, and keep along the coast of Cambodia and Cochin-China, keeping near the latter to Cape Turon; from thence it is a short run to Hainan; coast along this island, leaving the Taya Islands to the eastward; then steer to make the coast of China near Hai-Ling-Shan, and run along the coast to Macao. By this route a weak ship will find smooth water and many harbors, if necessary. This passage will, no doubt, be long and tedious, particularly before the middle of March or the 1st of April.

---

\* Horsburgh says that in March, April, and May, that is, at the commencement of the monsoon, a long and trying passage may be expected by the outer route, and during these three months he indicates the route to the west of the Paracels as preferable, which appears then to be the quickest. Toward the month of June, and in the strength of the monsoon, it is perhaps preferable, he adds, to take the outer route. The opinion of Captain Blake appears to us the best for all the months, as from March to April, near the Gulfs of Siam and Tonkin, the winds are often from N. W. to W., and near the coast of Cochin-China, as on all the west coast of the China Sea, the winds are variable, and the land and sea breezes generally weak. D'Après de Mannevillette also gives the route to the east of the Paracels as the best for every month. *Instructions, &c.*, p. 306.

† The *John Bannerman* and the *Martha* were thus lost.

Route to the east in the China Sea, with S. W. monsoon at its end, or commencement of the N. E. monsoon.

The route to Canton through the middle of the China Sea becomes uncertain if Pulo-Sapata is not reached early in October. About the middle of this month strong southerly currents, light breezes from the N., and calms prevail near this island, by which vessels have been delayed several days, and have run to the eastward, where they have been entangled among the numerous shoals. Others, to prevent further delay, have taken the eastern passage to China. The southerly currents about Pulo-Sapata are liable to slack for a few days at a time, and this, with the assistance of the favorable breezes which sometimes occur, may allow a vessel to reach  $13^{\circ}$  to  $14^{\circ}$  N., where the southerly currents are not so strong as off Cape Padaran, Pulo-Sapata and the Catwicks. Having reached the parallel of  $13^{\circ}$  or  $14^{\circ}$ , the vessel will be to the northward of all the banks, and then should be steered to the eastward, if the wind permits, and make the passage sure by approaching the coast of Luzon. During this season this route is followed in going to Manilla. The winds above the parallels of  $12^{\circ}$  or  $13^{\circ}$  N. are frequently from N. E. and E. N. E., making it difficult to gain to the eastward. Long tacks should then be made to the northward, and advantage taken of every change of wind to make easting. It would be imprudent to fall in with the coast of China to westward of the Grand Ladrone.\*

Palawan route. If late in the season, the Palawan route is preferable to all others, as the southerly currents and light breezes in the vicinity of Pulo-Sapata render the passage through the middle of the China Sea so uncertain. This route has been already mentioned.

From November to February. After the middle of November, and until February, vessels which sail indifferently often take the eastern route to China, or pass into the Sooloo Sea by the Strait of Balabac, and keep to the northward along the coasts of Mindinao, Negros, Panay, Mindoro, and Luzon, which route has already been given. According to Horsburgh, this is the most expeditious route that can be taken after the first part of November.

Route up the China Sea, with a steamer. N. E. monsoon.

A steamer, with little power, going from Singapore to Hong Kong during the strength of the N. E. monsoon, should pass to the westward of the Anambas,† then making to the northeast, pass some miles to the north of the Natu-

\* D'Après de Mannevillette.

† *Nautical Magazine*. Mr. Allen, master of the *Vixen*.

nas Islands and continue to the northeast until on the meridian of  $115^{\circ}$  E., when a course can be made to the north under the fore and aft sails. After passing to the westward of the Paracels, steer directly for Hong Kong against the monsoon. By passing to the westward of the Anambas, a smooth sea may be expected. When in the condition indicated above, to steer to the north, strong winds from the N. will probably be encountered; however, by using sail and steam, and taking the most advantageous tack, according as the wind varies, a steamer will generally make this passage in ten days. When the monsoon has lost its force, that is, during April, May, or June, a more direct route than the former can be taken by passing to the west of the Anambas, steer toward Pulo-Sapata, a little to the west of the Paracels, and then direct for China. If a series of strong head-winds are encountered, it will be useless for a steamer with little power to attempt to make headway against them. Other seamen think that the following route is more advantageous than those above mentioned: By passing inside of Pulo-Aor, traverse the Gulf of Siam to the coast of Cochinchina, and steer to the westward of Pulo-Condore and of Pulo-Ceicer de Mer; afterward keep along the coast of the continent as far as  $15^{\circ}$  N. latitude; then make for Hainan, and keep in sight of the coast. During this season, however, the currents run strong to the S., along the coast of Cochinchina, and it is by no means certain that light and variable winds will be met with there. Accordingly, the first route indicated, made by the *Vixen* during the strength of the N. E. monsoon, from Singapore to Hong-Kong in ten days, appears to be preferable, the distance run being 1,522 miles, giving an average of 6.35 miles per hour.

On leaving Hong Kong for Macao with steam, pass through the channel between Hong Kong and Green Island, where there is sufficient water for the largest ships; steer toward the north point of Chung Chow, or Water Island, to pass between this island and Lantau; in the middle of this channel is a large rock, even with the water and seen as it is approached; pass between this rock and Chung Chow; the least depth will be three and three-fourths fathoms; take then the channel between High Green and Lantau, and by keeping in mid-channel the least water will be three and two-thirds fathoms; from thence follow the chart. This is the shortest route from Hong Kong to Macao.

Route by  
steamer from  
Hong Kong to  
Macao.

Going down the  
China Sea.  
S. W. monsoon.

When leaving Macao to go down the China Sea during the S. W. monsoon, it is best to work down from the Maclesfield Bank, keeping between the meridians of  $113^{\circ} 30'$  and  $116^{\circ} 30'$  E., taking advantage of every variation of the wind and keeping on the most favorable tack.

After passing to the south of Paracels, continue to work to windward, without increasing the length of the tacks to the west sufficiently to approach the coast of Cochin-China, as along that coast the currents set strong to the N. N. E., and often attain a velocity of fifty miles in twenty-four hours; short tacks should therefore be made, so as to keep in the channel between the coast of Cochin-China and the shoals to the eastward of it, without standing sufficiently far on the western tack to make the coast of Cochin-China, nor far enough to the eastward to be on the meridian of the Investigator Shoal.

After having passed the Island of Pulo-Sapata, short tacks should be made to avoid entering the Gulf of Siam, where the winds may be light and variable from the southward. Sometimes, however, they are found from the W. N. W. and even from N. W., but they are never of long duration. The North Natuna will thus be made and the channel between these islands and the Anambas may be taken. Generally it is better to take the channel than to approach the coast of the Malay Peninsula and the Island of Pulo-Timoan, near which the winds are often light from the southward with calms, which force a vessel to anchor, to prevent being drifted by the currents which set to the N. with a velocity of twenty-five miles per day. In the passage indicated, the winds are fresh and steadier than near the peninsula. A vessel will thus reach Singapore or the entrance of the straits leading to the Java Sea. This route may be made in thirty days, the distance between Macao and Singapore being about 1,350 miles.\*

After what has been said, a good sailing vessel may traverse the China Sea from north to south during the S. W. monsoon. In some seasons, however, this navigation presents great difficulties. In June, July, and August it should not be undertaken with an ordinary sailing vessel, unless the winds are favorable on leaving the coast of China, and even with a good ship, bound for the west coast of India, this route should not be adopted during these three months

---

\* Captain Blake.

unless from very strong inducement. By leaving China in good season a very good passage may be made by this route; however, if bound to Bombay or Mahe, in October and during a part of November, the run would probably be long from Acheen to these ports. A vessel leaving China in May or June will make the passage to Bombay as quickly, if not more so, by the eastern straits than by crossing the China Sea for the Straits of Malacca or Sunda.

Before giving the routes between the ports in the northern part of the China Sea, we will speak of those in the seas of passages, as they are directly connected with the navigation of the southern part of the China Sea.

The passage from Java, Bally, or Lombock to Singapore, when the S. E. monsoon is well advanced, is often long and tedious, as the currents commence to set to the S. E. in October; besides, after passing Pulo-Mancap, light winds are frequent, hauling to the W. and N. W. The following details will be useful when this, the northern route, is adopted: \*

End of S. E. monsoon.  
Route from the eastern straits to Singapore by the Carimata Passage, and by the east route.  
North'n route.

After leaving the Straits of Lombock or Bally, the easterly winds will last beyond Pulo-Mancap. The best route to follow to that point is to pass between the Pandy Islands and Galion; this may be done with security, even at night; then pass to the south of the Island of Lubeck. A vessel should keep well to the westward of the shoals of Pulo-Mancap and a good distance from Discovery Bank and other dangers on the west shore of the passage. Then steer toward the easternmost of the Islands of Montaran, pass between this island and the one nearest to it to the westward, this channel is perfectly safe; then steer to the north-west along the coast of Billiton, but do not pass inside of the Banks of Montaran, as at this season the wind is rarely more to the westward than S. W., consequently a vessel will be sufficiently to windward when starting from the easternmost of the Montaran Islands to pass to the south of Pulo-Docan, Pulo-Taya, and Pulo-Sinkep, if it is possible to double the latter to enter the Brahallia or Great Channel; if not, take the Strait of Dasseer to the south of Lingin. After leaving these straits, steer for Singapore by the Strait of Durian. On the west coast of Sinkep and Lingin, and in the Strait of Durian, the tides are regular and the variations of the winds advantageous, besides those which blow

\* Captain McKenzie, *Nautical Magazine*.



from Sumatra, (called *sumatras*.) There is sometimes a calm before the *sumatras*. Should the tide be unfavorable an anchor can be dropped under foot. These winds should be received under double-reefed topsails, as the delay from shortening sail after they become violent will occasion a loss of time.

On the east coast of Lingin, the currents come from the China Sea and set strong to the S.; often, besides, the wind is from N. W. to N. so that little headway can be made until the Strait of Rhio is entered. It frequently happens that it is necessary to work to windward even as far as Singapore. In this case, instead of passing to the eastward of Lingin to take the Strait of Rhio, it is preferable to take that of Dassee.

Return from  
Singapore to  
Java, by the  
Carimata Strait.

Having worked through the Carimata Channel against the S. E. monsoon, it will be best, when leaving Singapore, to pass through the Strait of Rhio, then approach the coast of Borneo and make short tacks along that coast, anchoring when the tide is unfavorable. On leaving the Island of Rendezvous or Kumpal, steer toward the coast of Java; if going to the eastward, work to windward near that coast. The passage as far as Sourabaya can easily be made in fifteen to twenty days.

N. W. monsoon.

Going from the eastern part of Java, from Bally or Lombok to Singapore, with the N. W. monsoon, either the southern or northern route may be adopted; the one passes to the south of Java' by one of the eastern straits, from whence the trade-winds should be reached as quickly as possible, with which sufficient westing is made to return and make Acheen Head and cross the Strait of Malacca; the other crosses the Java Sea and the Strait of Carimata. The mean length of these passages is about sixty days, and the strong winds and heavy sea are very trying to a ship.

Eastern route.

Captain McKenzie considers the route to the east the preferable of the two. By this route, make the Moluccas Passage or the Strait of Gilolo; cross the Sea of Celebes and the Sooloo Archipelago, and from thence, with the winds from N. and N. E., take the Strait of Balabac to enter the China Sea, and cross it to Singapore. This route, which appears to be very roundabout, is, nevertheless, that by which the shortest passages are made, according to this officer. We will speak hereafter in detail of this route. It is the eastern route on leaving the Moluccas.

Leaving Amboyna for Banda during the strength of the S. E. monsoon, July, August, and September, a vessel should take the tack to the southward as far as the north coast of Timor, near which, at this season, the currents set to the E. and the winds are found varying from E. S. E. to S. E., which generally permit a vessel to reach Banda on the northern tack. Often this passage does not exceed six days. By going to the north of Ceram, on leaving Amboyna, it would be made much longer. In the N. W. monsoon the route from Amboyna to Banda is direct.

S. E. monsoon.  
Route from  
Amboyna to  
Banda.

On leaving Amboyna in the N. W. monsoon, and bound to the westward by the southern route, (that which enters the Indian Ocean,) a vessel should try to pass to the north of Timor and pass it to the west. In fact, if she falls to leeward of this island and is obliged to pass to the eastward of it, she will have great difficulty in getting to the westward by tacking between it and New Holland, in the Sea of Timor, where there is generally, from November to April, a heavy sea and strong winds from W. and W. N. W. with overcast weather. If obliged to pass to the eastward of Timor it will be necessary to work to windward near the southern coast of this island, and pass through the Strait of Limao, between Timor and Rotti; for by keeping to the north of Sahul Banks and near the coast, without doubt the sea will be less heavy and the wind less strong than at large.

N. W. monsoon.  
Route from  
Amboyna to the  
Strait of Ombay.

On leaving Amboyna or the Moluccas for the Malacca Strait or India, the southern route should not be taken in the strength of the N. W. monsoon. If leaving before the month of March, the eastern route is preferable, principally when going to the Strait of Malacca and the Gulf of Bengal. By the eastern route, on leaving Amboyna try to reach the Island of Amblaw, then work to windward near the east coast of Bourou, so as to profit by the land and sea breezes and the occasional squalls, the currents running to S. and S. E. which, at this period, frequently exist near Amboyna. Ceram and Manipa will thus be avoided. Having reached Point Lisatika, the west end of the Island of Bourou, steer towards Oby-Major and from there to the Strait of Gilolo. If preferred pass between Gagy and Guebe. Having cleared this strait get as soon as possible on the parallel of 5° or 6° N. latitude, without caring to make easting, as on these parallels the N. E. monsoon will be found. The best route to take then will be to pass to the

N. W. monsoon.  
From Amboyna, or the Moluccas, to the Strait of Malacca, or India, by the eastern route.

north of the Meangis and reach the south point of Mindinao. The channel formed by the south coast of the Island of Serangani should be taken and the Strait of Basilan to enter the Sea of Celebes. If this strait is entered in the morning with a favorable breeze it can be left by the evening; or a stoppage may be made at Sanboangan. On leaving the Strait of Basilan pass to the north of Sanboy Islands, and then steer toward Cagayan-Sooloo from this island, avoiding the dangers to the westward, take the channel between the Island of Benguay and those of Mangsee, entering then the China Sea, steer toward the Strait of Malacca.

S. E. monsoon.  
Southern route,  
March.

Leaving Amboyna for India in March, the southern route should be adopted; and as the winds during this month are still frequently from the W. it will be advisable to steer towards Bouro and then to cross toward the Islands of St. Matthew to work to windward in their vicinity. After reaching Velthoens Island steer to the south and, if the winds permit, pass through the Strait of Aloo, which is preferable to that of Panthar; having cleared it, keep to the westward as much as possible, to pass between Sandalwood and Savu, and pass this island to the eastward if any difficulty should be found in getting to the westward of it.

April, May,  
June, July, and  
August.

If Amboyna is left from April to August steer toward Gunung-Api, giving the Island of Lucepara a good berth, then steer for the western extremity of Wetta to pass between Ombay and Pulo-Cambing, then between Ombay and Timor. Having reached the Islands of Rotti or Savu the wind from S. E. will freshen gradually, and a vessel should pass to the southward of Savu, from whence India may be reached in twenty or thirty days.

Batavia.

If during these months a vessel is bound from the Moluccas to Batavia steer to make the Island of Roma, avoiding the bank, which is eight miles from its northwest point, then pass to the north of Wetta and steer for Pulo-Cambing, afterward keeping along the north coast of the islands between Ombay and Flores; if convenient pass between the north coast of the latter island and Rusa-Raji, or the north coast of Sumbawa and Lombock may be followed and from this last island pass either between Hog and Galion Islands or to the north of Urk, between the Four Brothers and Kangelang, when fol-

low along the coast of Madura and Java. We will now return to the special navigation of the China Sea.

When coming from the south during the S. W. monsoon, bound to Siam, a vessel after leaving Pulo-Timoan should keep well out until Pulo-Varela is passed; with a favorable wind, however, the passage can be made between the land and these islands without inconvenience; then steer to pass inside of Pulo-Brala, for the winds often come from the west, then take the channel between the outer Redang Island and the one nearest the coast inside the Great Redang; from thence steer to keep along the northeast coast of Pulo-Lantinga and Pulo-Printian, and follow the coast as far as the river Siam.\*

Gulf of Siam.

Vessels bound to the southward generally leave Siam with the N. E. monsoon; if they sail for the Strait of Malacca before the middle of September, they may expect long passages. In this case, the shore should be followed as far as the reef off Point Romania to take advantage of the winds from the land, and in every case to keep in a sufficient depth to anchor should the currents render it necessary, which often happens with strong winds from the E., up to October, when the currents run up the gulf along the west coast. In every other season, the rivers cause a current which runs seaward, taking an E. or S. E. direction, and vessels which, during the S. W. monsoon, are at the entrance of the gulf, are frequently drifted to the eastward twenty or thirty miles per day.

Route leaving  
the Gulf of Siam.  
N. E. monsoon.

On leaving the bar of Siam during the N. E. monsoon, steer to pass near Cape Liant and the islands adjacent to it; from thence steer for Pulo-Way, and if these islands, which are high, are not seen, make Pulo-Panjang. Although Pulo-Way may have been sighted it is prudent to make Pulo-Panjang, and from there steer for Pulo-Aor, if it is intended to pass through the Strait of Malacca or Banca.†

Leaving the bar of Siam during the S. W. monsoon, keep near the west coast of the gulf and work along the Malay coast, if bound to the Strait of Malacca or Banca. If bound to China, Cochin-China, or Manilla, follow the west coast of the gulf as far as Point Cin, from this point steer to the south-east to make Pulo-Panjang, and if not seen, keep to the eastward until it is made, it being almost indispensable to

Route leaving  
the Gulf of Siam.  
S. W. monsoon.

\* D'Après de Mannevillette, *Instructions*, p. 244.

† D'Après de Mannevillette, p. 248.

make it, at the time, when following this route; allowance should be made for the currents which set to the E. during this season.

Having passed Pulo-Panjang, steer to the southeast for Pulo-Oby, distance about fifty-one miles, and pass sufficiently far from it to avoid the dangers in its vicinity.\*

Route from Pulo-Oby to Manila.

If going to Manila from Pulo-Oby, pass to the southward of Pulo-Condore and Pulo-Sapata; then make to the northeast as far as the parallel of  $12^{\circ}$  N., when being to the northward of all the banks steer directly for Manila.

In passing from the Redang Island to the coast of Cambodia in the month of March, a vessel should get as much as possible to the east, as at this period currents running to the W. are found near Pulo-Oby, which enter the gulf. There are also, at this period, winds from the N. E. and E. N. E.†

Route from Macao to Manila.

S. W. monsoon.

Vessels trading between Macao and Manila continue to do so in both monsoons. On leaving Macao for Manila with the S. W. monsoon, take advantage as much as possible of the hauling of the wind to the S. E. or E. to steer to the south-southwest or south, towards the Macclesfield Bank. From this point the passage to Manila is sure; in fact, unless the winds should be from S. or S. S. E., a vessel should reach Manila on one tack, and with the wind at S. would make Goat Island, or the land of the south part of the bay.

N. E. monsoon.

Bound to Manila during the N. E. monsoon, a vessel should leave by the Lema Channel and keep as much as possible to the east, steering for the northwest point of Luzon, toward Cape Bolinao. In this season the currents setting to leeward should be guarded against. When in the latitude of that cape or of the adjoining coast, keep a suitable distance from it to avoid the banks in its vicinity, and after passing the Sisters, a vessel should keep twelve or eighteen miles from the land, until to the southward of the islands and dangers which extend outside of the Capones; from there follow the coast to Manila Bay.

Route from Manila to Macao.

S. W. monsoon.

The S. W. monsoon being fair from Manila to Macao, a vessel should steer directly for the Grande Ladrone, and if the wind is fresh from S. W. on approaching the coast of China, bring the island to bear N. by E. or N. If the wind

\* D'Après de Manneville, *Instructions*, p. 248.

† *I dem*, p. 319.

inclines to the N. E. or toward the E. steer for the Grande Lema and enter by this channel.

On leaving Manilla Bay for Macao with the N. E. monsoon, keep near the land as far as Cape Bolinao, from thence run off shore if the winds permit of making northing. But with the winds from N. E. and N., especially if the vessel sails badly, tack along the land as far as Cape Bajador, before keeping for the coast of China.

N. E. monsoon.

From Pulo-Sapata to Manilla in the S. W. monsoon, steer to reach the parallel of  $13^{\circ}$  N. latitude passing well outside of the banks and shoals to the eastward in the China Sea; when on the parallel of  $12^{\circ} 30'$  or  $13^{\circ}$ , run directly for Goat Island or for Luban Island, which are thirty-six or thirty-nine miles to the southwest, of Manilla Bay. Having passed nine or twelve miles north of Goat Island, steer for Mariveles or Corregidor, at the entrance of Manilla Bay, and nearer to the northern than to the southern shore. When six miles west of the Corregidor, steer for it to pass between it and the Tas-de-Foin, from which it is thirty-three miles to Manilla and twenty-four or twenty-seven to Cavite.

Route from  
Pulo-Sapata to  
Manilla.  
S. W. monsoon.

The N. E. monsoon is fair from Manilla to Pulo-Aor and the Straits of Malacca and Banca. On leaving the bay steer to the westward as far as the parallel of  $12^{\circ}$  N. latitude and continue to run thus until in at least  $111^{\circ}$  E. longitude, when there will be a certainty of having sufficient westing; steer then for Pulo-Sapata, taking into account the currents setting to the westward, which are at times very strong during the season; if Pulo-Sapata is not seen, on reaching its parallel steer to get soundings and then for Pulo-Aor.\*

Route from  
Manilla to Pulo-  
Aor.  
N. E. monsoon.

When going to the Tonquin River, in the gulf of this name, a vessel should take advantage of the S. W. monsoon and keep along the coast of Cochin-China as far as Cape Choumay, the south point of the gulf, or as far as Tiger Island; from there steer toward the north; passing to the west of Hainan Island a suitable distance, which the soundings will indicate, as they diminish on nearing the adjacent banks; these should not be approached in a less depth than fourteen or seventeen fathoms.

Route to enter  
the Gulf of Ton-  
quin.

If the Island of Hainan is not seen when on the parallel of  $19^{\circ}$  N., and on soundings of twenty seven to thirty-three

---

\* D'Après de Manuevillette, *Instructions*, p. 323.

fathoms, steer for Norway Islands, which are about thirty-nine miles from the bar of Tonquin River; on approaching the entrance of the river it will be necessary to work with the tides, which may greatly retard a vessel when setting out of the gulf.

<sup>1</sup> Route from the Gulf of Tonquin.

In the N. E. monsoon, when leaving the bar of the Tonquin River, steer to make Hainan Island, the northwest coast of which should not be approached, and to this end do not come inside of seventeen fathoms on the sand bank, which is said to extend eighteen or twenty-one miles off this part of the island.

Easterly winds often prevail in the gulf during the N. E. monsoon, though to seaward of its entrance the wind is, at the same time, from N. E.

Navigation on the east coast of China, from south to north, against the N. E. monsoon.

Going from south to north on the coast of China, that is, from Macao to the Chusan Islands, against the N. E. monsoon, there are many routes. The first is to work across the Strait of Formosa; the second, to pass to the eastward and near this island, and the third to pass to the east of Formosa and well to the seaward. By this last route, which Commander Goldsmith considers the best, he says the passage can be made from Hong-Kong to Chusan in eighteen or twenty days.\* This passage against the monsoon is very trying to sails and spars, as there is a continued series of bad weather, and generally a double-reef topsail breeze with a heavy sea.

If bound to the north from Hong Kong during this monsoon by the Formosa Channel, if the winds permit, the Lyee-Moon Pass should be taken, when work to windward to pass the Nine-pin Rock.† Make the entrance of Mir Bay and keep along the coast and the Island of Single, and the group to the northward of it. In this locality, at the time of full and change, the flood sets to the N. E. with a velocity of one and a half to two miles per hour. The winds are generally from E. N. E., or rather, they blow parallel to the coast; they turn more to the northward when the coast takes that direction, and become fixed at N. N. E. after the Reefs and Island of Lamock are passed.

After passing Single Island and Acoong-Chow Rock, a remarkably sharp-pointed rock, stand into Harlem Bay and pass Mendoza, but do not approach it nearer than three

\* *Nautical Magazine*, 1845.

† Captain Mundy, R. N., *Nautical Magazine*, 1846.

miles from Ty-Sing-Cham or Pedro-Blanco, to avoid a dangerous rock on which the sea breaks only at low water, or with a heavy swell. Continuing to the north keep near the China coast as far as Cape Ma-Urh, to profit by the tides; outside there is a constant current setting to the S. W. Should the weather be uncertain, it is better to anchor under shelter of one of these points than to run off shore. In Fy-Sami Bay, a little to the westward of Hie-Che-Chin and under Point Cupehi, there is a good anchorage in eight to ten fathoms of water. Breaker Point should be avoided during the night as the shoals and rocks above water extend two miles from it. Having reached Cape Ma-Urh it is necessary to decide on the route to be taken, whether that by the Formosa Channel, or that to the eastward of this island; sometimes the coast of China is left before reaching Cape Ma-Urh, if going to the east of Formosa. At no season of the year, however, is there any great difficulty in passing to the eastward of this island; as along its coast there is a strong current setting to the northward, at the rate of two and a half to three miles per hour.\*

If it is desired to keep on the coast of China great difficulty will be experienced in going up the strait from Lamock Islands to the White Dogs, as the currents set constantly to the S., and in the middle of the channel attain a velocity of one and a half to three miles, according to the force of the monsoon; a vessel should then make short tacks along the eastern part of the Lamocks and then keep as near the land as possible, from Point Jokako to the vicinity of Tung-Sham (Tong-Sang) Bay, which is the best on the coast; the shore being steep, too, it can be approached without danger. The small group of islands to the north of the Rees Channel is a shelter from the sea, and should be taken advantage of. If to the eastward of these islands toward night it is better to anchor under their lee than to tack off shore. In this locality the tides are strong and the currents produced by them are very uncertain. In dark nights, therefore, a vessel to the north of these islands should not run for Hoo-Tow-Sham (Hutau) Bay, as many vessels have been lost on the dangers at its entrance. This locality, says Captain Mundy, may be regarded as the only dangerous one on this route. The rocks called the Two Brothers are an excellent point to make; they are detached from the coast,

First route by  
Formosa Chan-  
nel.

\* See Chart of Currents. *General Examination of the Pacific Ocean.*



and there is no known danger at a short distance from them; then keep along the coast toward Red Bay; near the coast will be seen many isolated rocks, but, as yet, no dangers under water have been discovered in their vicinity, excepting a reef three-fourths of a mile from the coast and three miles to the south of the anchorage of Red Bay. From this anchorage, in clear weather, Chapel Island can be seen, which, by day, can be passed to the east or west, taking care to avoid the Merope Bank.

**Port of Amoy.** After passing Chapel Island, the islands at the entrance of Amoy will be seen. If the weather is thick and the winds fresh from N., approach near the north coast, and when the sea becomes smooth anchor in about seven or ten fathoms; the sea will always be smooth at the entrance to Amoy with the wind at N. or N. E. For entering the port see the special directions.

From the latitude of Amoy, in going up the Formosa Channel, keep as near the land as possible with safety; enter the Bay of Lee-o-Loo, pass near Dodd Island, and into Hooe Tow Bay, anchoring during the night if the tide is unfavorable.

The pagodas of Chimmo and Chin-Chew, visible a considerable distance, are two good points for rectifying the position. On leaving the latter, after passing Cape Tong-Boo the swell will be less, and longer tacks can be made in the channel, as far as the Ock-Seu Islands, three barren rocks, under the lee of which there is no shelter, unless extremely near. After passing these rocks, rounding them on either side, the Island of Lam-Yit should be approached as near as possible. In this locality, during the whole N. E. monsoon, the winds are fresh, weather squally, and current so strong, even within ten miles of the land, that it is absolutely necessary to work by short tacks to the northward toward the Three Chimneys, taking care not to approach too near Reef Islands or Cape Double, but pass to the west of Turn-About Island.

Passing this point is probably the most difficult part of the navigation in going up the Strait of Formosa, and if the monsoon has but its ordinary force, it may happen that with a head-tide a vessel may be driven back to the south of Ock-Seu, if anchorage is not made to leeward of one of the islands, or does she not keep close under the land; the swell, besides, is so heavy that a vessel is much strained by forcing her.

Having passed the Three Chimneys, the first islands are the White Dogs, which can be passed on either tack, according to the weather. Then reach, by short tacks, the Island of Matsou, when the sea will be smooth until passing Chang-Chi. To the south of this island there is a good anchorage, which should be taken if it is desired to communicate with Fou-Chow-Fou; if a boat is to be sent, the vessel should anchor at the White Dogs to await her return.

If the weather is passable, there will be no sea after passing Chang-Chi; when past Trio Rocks, tack between them and the Larue, Alligator, and Tong-Yang Islands, being careful to avoid the Larue Rock, which is always visible. Between these islands there is anchorage in depths varying from eighteen to thirty fathoms. At the period of the syzygies, the tides attain a velocity of three miles; the neaps are one and a half miles; the ebb commences from the W., and turns to the S. W. and S. In the morning, the winds haul generally to N. From this group, make the Pih-Seang Islands, and from there to Kew-Shan leave the different groups of islands to the west until reaching Hih-Shan. A vessel can work with security, by day or by night, between these islands and the coast; however, a vessel should not pass to the west of Patahecock, the southernmost of the Kew-Shan Group, four hundred and fifty feet high, except in the day-time, there being danger in the channel and little water near Cape Montague. Between this cape and Patahecock there is a rock showing at half tide which is dangerous, and should be passed to the eastward; then work between the sunken Pylades Rock and Bear Island. The Welps and the Corkers, a remarkable group of rocks, will then be made; these may be passed on either side. If working to the eastward of Kew-Shan, the vessel will pass near the Mouse Rock, which is flat and covered at high water.

In this locality the tides set to the N. W. and S. E., and there are good anchorages in from four to eight fathoms. Terminating these directions, which have been given in detail, as they afford an idea of the Formosa Channel, we will repeat, that a good passage cannot be expected, unless the coast of China is kept aboard.

In taking the second route,\* to the eastward of Formosa, when leaving the Lema Islands, keep near the coast, as we have before said, and profit by every favorable circumstance

Second and third route, passing to the east of Formosa.

---

\* The master of the corvette *Wanderer*, *Nautical Magazine*.

to get to the eastward; it is necessary to avoid the adverse currents, which are constant seaward, by tacking in the smooth water of the bays, which are clear, during the day; and if the wind is too strong, it is better, if an anchorage can be made, to remain there until it moderates; lastly, a vessel should run to the eastward when the wind is favorable, and return to the land as soon as it hauls ahead; this, in reality, is the difficult part of the passage, and it requires constant care.

When sufficiently up the coast, which, according to many navigators, would be Cape Ma-Urh, keep to the southeast to pass the southern point of Formosa. When the wind is N. E., however, some leave the coast before making this cape; after passing the south point of Formosa, pass to east or west of the Meia-co-Sima group, according to the wind. This route offers the advantage of a favorable current, setting strong to the northward from Formosa. When at sea, the wind varies from N. to the E.; it is followed by a fresh breeze from the N. W., when the most favorable tack should be taken. It is best to avoid the land until the vessel can fetch to the north of Kew-Shan, where good anchorage may be obtained under the islands.

Master Forster, speaking of the routes just mentioned, says that the currents in the Formosa Channel should prevent the first route being taken, and that the passage outside or to the eastward of Formosa is generally the most advantageous during the N. E. monsoon. He even says that on leaving Amoy for the Chusan Islands, pass to eastward of Formosa, unless unable to work out of the strait. This is also our opinion.

Routes from  
India to the ports  
of the east coast  
of New Holland.

From the routes we have given, it will be easy to determine which should be taken in going from the different ports of India to Port Jackson, situated on the east coast of New Holland.

Northern route.

There are two routes to which we shall confine ourselves: One, the northern route, which leads into Torres Strait, ought to be taken from the beginning of September to the end of March, the period when the N. W. monsoon blows in these latitudes; the other, the southern route, which goes round New Holland to enter Bass Strait, is taken from March to September, the period when the S. E. monsoon prevails in Torres Strait.

We shall give, hereafter, directions for the navigation of

Torres Strait, although it is local and more especially enters into the navigation of the Pacific Ocean.

In the southern route the object should be, when sailing from ports situated in the north of the Indian Ocean, to reach as soon as may be the zone of the trade-winds; to cross this zone rapidly in an oblique direction, inclining as much as possible to the west coast of New Holland, and follow the south coast as far as Bass Strait.

Coming from the Cape of Good Hope, the same route must be taken as to go to China by the Great Eastern Passage.

Leaving Canton during the S. W. monsoon, bound to the east coast of New Holland, the shortest route would generally be the eastern, which enters into the Pacific Ocean by the Straits of Formosa; the course is next to the eastward, enough to cross obliquely the belts of the N. E. and S. E. trade-winds, in such a manner as to arrive off the port of destination in Australia when on its parallel. This route offers no other difficulties than those of the navigation among the islands and archipelagos of the Pacific Ocean.

Southern route.

The same route will be, on the contrary, very difficult and very tedious in the N. E. monsoon; for it will be necessary to pass out of the Strait of Formosa to the Pacific Ocean, and to work to the northward and eastward until clear of the N. E. trade-winds, and in the variable winds north of the parallel of  $30^{\circ}$  of N. latitude, with which easting can be made; in all cases the object will be, on leaving the Straits of Formosa, to make the shortest possible track through the trade-winds. Generally, the meridian of  $165^{\circ}$  of E. longitude should be reached before turning south.

Route from the ports of China to the east coast of New Holland.  
S. W. monsoon.

During the N. E. monsoon, that is, from September to February, instead of taking this route, it will be better to keep in the China Sea, and thus avoid a great deal of bad weather and make also a shorter voyage. The course is east of the Great Natunas, then through the Carimata Passage; afterward it runs for the east point of Madura, to pass between the islands of Pandy and Galion and Bally Straits, if preferred. It is better, however, to take Lombock's Strait, and better still to take the Strait of Allas.

Same route.  
N. E. monsoon.

When clear of the straits take advantage of the changes of wind to work to the southward; since, at this season, the winds blow generally from S. S. W. to S. S. E. in the space which extends from the northern limit of the trade-winds to

the eastern straits, it will be necessary to make a long circuit to the west to cross the belt of the trade-winds and reach the variable winds of the southern hemisphere; when in the variable winds, the progress eastward is easy. In the months of March and April a vessel can pass through Bass Strait, or, if preferred, south of Van Diemen's Land, on account of the E. winds which are frequent in the strait during these two months. In all the other months Bass Strait must be taken as the most direct and shortest route.

Return from  
the ports of the  
east coast of New  
Holland to India.  
Southern route.  
From September  
to March.

On leaving Port Jackson, or the ports of the east coast of Australia, bound to India or to Europe, a vessel can pass through Bass Strait or double the southern extremity of Van Diemen's Land, provided she sails between the beginning of September and the 1st of March. In January, February, and March, she will meet S. E. winds in the neighborhood of Van Diemen's Land more frequently than in all the other months. These winds can be turned to account for running to the westward; it is necessary, however, to keep at a good distance from the south coast of Australia to profit by all the changes of wind, and to escape being wrecked by squalls from the S. W., which are frequent at this time.

Ships bound to Europe have also taken this route during the winter months of this hemisphere, (June, July, and August;) bad weather rendered it very difficult, it is true, but not impossible, even at this season.

Vessels should get as soon as possible into the belt of the trade-winds of the Indian Ocean, and when there, take the most direct route for the port of destination; under favorable circumstances, the voyage from Port Jackson to Bengal is two months long; ships have taken fifty days to go from Bass Strait to False Bay. The best passages have been made during the summer months, (October, November, December.)

Northern route  
by Torres Strait.  
From March to  
September.

From March to September the voyage from Port Jackson to Bengal, or to the way-ports, may be made through Torres Strait. In this route run to the north along the coast of Australia as far as Sandy Cape; then take the inside route. If the outside route is taken, on leaving Port Jackson, run for the meridian of 155° and pass to the west of Howe and Middleton Islands; then steer to the northward, carefully avoiding Wreck Reefs, and Bampton, Minerva, Bellona, Ball, Kenn, Frederic, etc. banks, among which are passed Lamb Island and Bass Island. These banks and islands

are situated between the parallels of  $24^{\circ}$  and  $20^{\circ}$  S. latitude. Allowance must also be made for a northwest current of at least one mile an hour. After doubling round Wreck Reefs, steer to pass sixty miles to the east of Diana Bank; then enter Torres Strait, for the navigation of which we will give particular directions.

NAVIGATION OF TORRES STRAIT BY CAPTAINS KING AND BLACKWOOD.

The navigation of Torres Strait, one of those that connect the Indian with the Pacific Ocean, has for many years possessed great importance; and as the number of vessels taking this route increases every day, we think it will be useful to collect and combine all the information scattered through the *Nautical Magazine*, in such a manner as to give to seamen as complete an idea as possible of the navigation of this strait. The following is drawn up from the directions of Captains P. King, Blackwood, and Yule, who made the surveys and charts of this dangerous region. We have confined ourselves to copying them *verbatim*, while mixing them together.

As we have already said, Torres Strait may often be taken with advantage in the routes for going from the ports of India to those of the east coast of Australia and back. It was long believed that it was impossible to get through this strait during the N. W. monsoon; the examination of it made by Captain Blackwood has demonstrated that this is a mistake.

On coming from the Indian Ocean into the Pacific Ocean, through Torres Strait, there are two routes that may be taken from Cape York to the ports of the east coast of Australia; the first, the inner route, follows the east coast of this continent from Cape York as far as the reef of Break-Sea-Spit, which makes out from Sandy Cape to the northward; the second, the outer route, leads out of the Barrier Reefs to the northward of Darnley Island, through Bligh Passage, or through the passages north and south of Raine Island. When outside of the Barrier Reefs the vessel takes, in reverse, the route that we have already laid down; that is, she passes east of Diana Shoal, between Albert's Reef\* on the west and Mellish's Keys to the east, and shapes a course

Inner route.

Outer route.

\* On Chart No. 1092 of the French Hydrographic Bureau, this bank is called Alert's Reef; it is north of Farquhar Group and Vine's Bank.

to pass to the eastward of Keen's Reef, Wreck Reef, and Cato's Reef, up to the parallel of Sandy Cape, south of which she finds an open sea.

Sailing from the ports of the east coast of Australia for India, the inner route may be followed up to Cape York, or the outer route, taking Bligh Channel or the passages of Raine Island.

"Opinions are divided\* on the subject of the respective advantages of the two routes we have just described; for a quick passage the outer route is certainly preferable, but, all circumstances considered, the inner route is generally regarded as the safest.

"It appears to me that the inshore track of Captain King should be followed if in a steam-vessel, at all times, as the small delay occasioned by anchoring for the first five or six nights would be amply compensated by the rapid runs she would make during the day-time in the smooth water of that sheltered track; and the distance from Cape York to Sydney being not two thousand miles, she ought certainly to perform that distance in a fortnight, taking also into consideration any adverse gales that she might meet with when in the vicinity of Sydney during the winter season.

"If in a sailing vessel I would recommend steering out of Torres Straits by the passage (lately surveyed by her Majesty's ships *Fly* and *Bramble*†) north of Darnley Island, which has the peculiar advantage of clear ground in every part for the purpose of anchoring, and of being quite devoid of sunken coral patches.

"If furnished with the charts executed by her Majesty's surveying vessels in 1844, I cannot conceive that, with common caution, a vessel should meet with accident in sailing out by 'Raine's Island Beacon'; but this latter passage has the disadvantage of foul ground to anchor in, in the space between the Bird Isles and Raine's Island, although the route is the shorter of the two in point of distance.

"Opinions are divided as to which is the preferable track to follow when passing through Torres Strait from east to west, or the return passage from Sydney to India; but there can be no question (if speed be an object) that in the height of the S. E. trade, or from May to September, the passage entering either by Raine's Island Beacon or by

\* Directions of Captain Blackwood, *Nautical Magazine*, 1845, p. 688.

† Ships belonging to the expedition under Captain Blackwood's command.

Bligh's Entrance, north of Darnley Island, may be performed in half the space of time that it takes to follow the inshore route, along the coast; and such being the fact, it will be the passage most generally used by the merchant shipping, to whom a speedy market is of the first importance.

"A steam-vessel will have the great advantage also of being able to perform this return route through Torres Straits in the westerly monsoon, or from November to March, at a time when it is impracticable for sailing-vessels, and I think that in all cases her best tack will be the inshore passage of Captain King, especially as she may supply herself with wood fuel at any part of the east coast. I can see no reason why her return passage from Sydney should occupy more than five weeks to Singapore, as she will certainly carry up the S. E. trade to the latitude of  $14^{\circ}$  or  $15^{\circ}$  S., when she may meet with the westerly wind."

We have thought that these views of Captain Blackwood would be useful in giving seamen a general idea of the navigation of Torres Strait.

"Hitherto Torres Strait has only been navigated generally by ships passing from east to west, but on three or four occasions vessels have sailed through in the opposite direction. This passage, however, has always been attended with great delay, as it was found that the westerly monsoon, which prevails from November to March, inclusive, in the seas of the Indian Archipelago, does not blow steadily within Torres Straits, where it only appears in spurts of eight or ten days' duration, about the change of the moon. Occasionally these westerly winds blow with considerable strength, but they are usually unsteady—in fact, mere interruptions of the S. E. trade-wind. These spurts may be expected in November and in the following months until March. Sometimes, but rarely, they are encountered as late as April. \* \* \* The question of winds is, however, of little importance when steam routes are under consideration, especially on the present occasion, as parties interested will be satisfied on learning that no winds have ever yet been experienced in Torres Strait which are calculated to interfere materially with the progress of steamers in either direction. \* \* \*

General remarks.  
Winds.

"The easterly trade-wind prevails throughout the year in the sea contiguous to the northeast coast of Australia. From May to September, inclusive, it blows generally from E. S.



E. to S. S. E., strong and steady. During the remaining months of the year the trade-wind becomes light, and draws more to the northward, sometimes blowing for several days from E. N. E. and N. E. In January, February, and March, spurts of short duration from the N. W. may be expected about the change of the moon, sometimes in strong gusts, but generally moderate with clear weather. The writer has already alluded to a spurt of N. W. wind which he met with in the end of April, 1844, in latitude  $19^{\circ}$ , but they rarely occur so late in the season.

"On the east coast of Australia, between Moreton Bay and Sydney, westerly winds prevail from May to September, the winter months of the southern hemisphere. Gales are of common occurrence at this season; but, as the wind blows from the land, the water is smooth, and they offer little obstruction to steam navigation. During the summer months the wind is generally from the eastern quarter, assuming in a great degree the character of a trade-wind.

Currents.

"The currents on this coast are chiefly influenced by the trade-wind. The stream from the eastward divides at Break-Sea Spit, when one portion runs to the N. W. toward Torres Strait, and the other curves to the S. along the east coast until it reaches Cape Howe, when it unites with the body of water forced through Bass Strait by the westerly winds, and runs eastward again toward the south end of New Zealand.

Routes from  
Torres Strait  
during the N. W.  
monsoon, coming  
from the Indian  
Ocean.

"If a ship be proceeding from Madras or Calcutta through Torres Straits, she will doubtless go down the Bay of Bengal, round the west coast of Sumatra; but if from Singapore or China, she would probably find Allas Strait the best passage to go through, as good anchorage is to be obtained all along the western or Lombock side of the strait, at a distance of two miles from the shore.\*

"Having cleared the straits of Allas, a course may be shaped to pass to the southward of Sandalwood Island and Rotti (both of which points are very accurately placed in the charts,) at a reasonable distance from the latter, so as to avoid the Sahul Shoal, parts of which are dangerous to approach. The Strait of Rotti is safe to sail through, although Captain Laws reports a danger in it, the position of which should of course be avoided by keeping on the north side of the strait.

---

\* Blackwood

“From the south end of Rotti a direct-course may be shaped for Wallis Islands, at the western extreme of Endeavor Strait, avoiding one or two coral banks, on which both Captain Flinders and ourselves got soundings; they are small in extent, but less water might possibly exist in parts which were not tried by the lead.”\*

Captain Mackenzie says, on the contrary, that ships sailing from India or China for Torres Strait would do well to keep on in the Java Sea, shaping their course to the north of the Sunda Islands, until they leave it by the passage between Ombay and Pulo-Kambing. During the two monsoons, Captain Mackenzie says, the water is smooth in the Java Sea and the Moluccas, compared with what is found south of the Sunda Islands and in the Sea of Timor, on account of the heavy swell from the S. W. usually encountered there. Sailing vessels will have, moreover, in keeping in the Java Sea, the advantage of meeting with land breezes near the north coast of the Sunda Islands. On leaving Ombay they will take a direct course for Torres Strait.

According to this, vessels leaving India ought to pass through the straights of Malacca for Singapore and the Java Sea; cross this sea, leaving it by Ombay Strait, or by passing between Timor and Wetta, and keep in the Timor Sea as far as Torres Strait. This route appears particularly advantageous for steamers.

This opinion of Captain Mackenzie is confirmed by the following information;† it will complete what we have already said of the navigation of Java Sea.

To go from Singapore to Port Jackson, through Java Sea and Torres Strait, two routes may be taken, known under the names of southern and northern routes.

Routes for a steamer from Singapore to Port Jackson, through Java Sea and Torres Strait.

“With the exception of the strait between Celebes and Salayer, on the northern track through the Java Sea, and the passages through the islands east of Madura on the southern track, there are no channels throughout the route

\* Flinders' Bank, (15 fms., coral bottom,)  $9^{\circ} 56'$  S. latitude,  $129^{\circ} 35' 8''$  E. longitude; Fly Bank, (12 fms., coral bottom,)  $9^{\circ} 52'$  S. latitude,  $128^{\circ} 39'$  E. longitude.

† We borrow this information from the *Nautical Magazine* 1853, p. 113. We sum up whatever will be really useful of the very long directions given in this publication by Captain G. W. Earle. We shall put into notes the descriptive part of the English directions, so as to separate the routes from all accompanying details.

so contracted as to render the navigation difficult either during night or day; and by properly timing the departure of a steamer from either terminus, (a process with which steam navigators in the Indian Seas are familiar,) it can be so arranged that the former may be passed during daylight. It should be observed that no weather is likely to be experienced throughout the route sufficiently boisterous to retard the speed of steamers of a large class, and thereby interfere materially with calculations made previous to starting.

"About 8 o'clock in the evening is the time best suited for the sailing of the vessel from Singapore, and as the steamers with the outward mails from Europe so time their departure from Penang as to arrive at Singapore almost invariably at 10 or 11 o'clock in the forenoon, this arrangement will afford ample time for transferring the mails and embarking passengers. From the outer roads the course is E. by N. to

"Pedra Branca, (thirty-two miles,) a detached rock, twenty-four feet in height above the level of the sea, situated nearly in the center of the eastern entrance of the Strait of Malacca, which has been the leading mark for vessels entering or leaving the strait for ages past. The main channel, which lies immediately to the north of the rock, is four miles wide in the narrowest part. A light-house of dressed granite, seventy-five feet in height, has recently been erected on the summit of the rock, which is probably the most perfect of the kind that has ever been constructed to the eastward of the Cape of Good Hope. The light, which has been regularly illuminated since the 15th of October, 1851, is on the revolving principle, attaining its greatest brilliance once a minute. It is visible from the deck of a ship at a distance of fifteen miles, when it disappears below the horizon; but it may be seen much further from the masthead, as its brilliancy is so great that the horizon is the only limit to its range. The reefs and dangers which beset the eastern entrance of the Strait of Malacca are all within the influence of the light as visible from a ship's deck. It has been named the 'Horsburgh Light-house,' as an appropriate tribute to the memory of one who labored so indefatigably in facilitating the navigation of the neighboring seas. \* \* \*

Carimata pas-  
sage.

"From Pedra Branca the course is about S. E. by E. three hundred and fifteen miles, with soundings of twenty-

five to thirty fathoms mud, to 'The Carimata Group,' (three hundred and forty-seven miles,) a cluster of islands lying at the northern entrance of the strait between Borneo and Biliton, commonly called the Carimata Passage.\*

"The most frequented track through the Carimata Passage lies to the south of Souroutou, the channel between it and Ontario Reef being somewhat less than twenty miles in breadth. When the peak on Carimata comes to bear north-northwest, a south-southeast course, which will bring the peak right astern, leads clear through the strait, about mid-channel between the Mancap Shoals, which extend from the southwest point of Borneo, and the reefs on the eastern side of the strait. The east island of the Montaran Group may be seen in clear weather from the masthead while passing; but as the Peak of Carimata will be still visible, no other leading mark is necessary. The depth of water throughout the passage varies from fifteen to twenty fathoms mud.

"After passing through the Carimata Passage, the navigator has the choice of two beaten tracks to the eastward, which unite at Pulo Kambing on the north coast of Timor, each of which has its peculiar advantages at certain seasons. During the prevalence of the easterly monsoon, from April to September inclusive, the southern track, along the north side of the islands east of Java, is to be preferred by steamers bound to the eastward, as during this season the current generally runs in that direction, after passing Bali, at the rate of between one and one and a half knot an hour.

The southern route to be taken during the easterly monsoon.

The northern track, by the Strait of Salayer, has the advantage in point of distance by about thirty miles; and as the westerly monsoon, which prevails from October to March, is often attended by squalls and heavy rain among the islands east of Java, while the northern track enjoys comparatively fine

The northern route to be taken during the westerly monsoon.

---

\* "Carimata, the principal island of the group, is fifteen miles in circumference, and consists of high land, with a peak near the centre, upward of two thousand feet in elevation, which is visible in clear weather at a distance of fifty miles. Souroutou is also high, but more level, with a hummock near the western extreme, which is visible at a distance of twenty-five to thirty miles. The strait which separates it from the southwest end of Carimata is two miles and a half wide. I passed through this strait in 1834, and had regular soundings in eight or nine fathoms; but it has never been fully surveyed, and as a steamer has the advantage over sailing vessels in being able to pursue a straight course, without having to make short cuts through the islands to avoid detention by contrary winds, there will never be any occasion to go out of the beaten track."

weather, the latter is likely to be preferred by steamers passing in either direction during that season."

Southern route  
in Java Sea.

On leaving the Carimata Passage, if the southern route is taken, steer directly for the Island of Bawian.\*

Island of Bawian.

"If the steamer does not arrive abreast of Bawian until after dark, it will be best to steer for Pondy, off the east end of Madura, so as to pass through the channel between it and Gilion† soon after daybreak. If, on the other hand, Bawian is passed before dark, the better course will be to steer for the northwest end of Kangelang, which will afford a clear run during the night, and the channel between that island and Urk may be adopted. Both these passages are thoroughly well known, and are much frequented by shipping.‡

"The passage between Pondy and Gilion, or Gili-Yang, is generally adopted by ships from Bali Strait bound to Singapore and China, and by the Dutch Company's ships bound to Banyu-Wangi, to fill up with coffee previous to their homeward voyage.

"Soon after passing through the islands east of Madura, the depth of the sea becomes unfathomable, and the route during the ensuing four days will lie across the volcanic gorge which separates the continent of Asia from that of Australia. A course should now be steered to reach the parallel of 8° S. when abreast of the northwest extreme of Sumbawa, from which point a due east course along the same

\* "Bawian, seven hundred and five miles. Lubek of the old charts, an island about thirty miles in circumference, consisting of a central mass of hilly land about 2,000 feet in elevation, with plains of small extent at its base."

† Gilion, or Gili-Yang. The word *gili*, in the language of Madura, means island.

‡ Pondy (eight hundred and seven miles from Singapore) is about nine miles in circumference. It is a table-land, varying in height between eighty and one hundred and fifty feet, bounded on the sea-coast by steep cliffs.

The Island of Galion (so called on the French charts) is more than double the size of Pondy, and differs in appearance, as the hills slope gradually down to the sea-shore.

Kangelang, or Kangeang, is visible from a ship's deck at a distance of thirty miles. The channel between this island and Urk is ten miles wide, and perfectly safe, with forty to fifty-three fathoms in mid-channel; care must be taken to avoid the Takat Shoal, (Four Brothers of the charts,) a coral reef with three low sand-banks upon it; but as it is distant nearly twenty miles from Kangeang, only ordinary precautions are necessary.—G. W. EARLE.

parallel will lead clear to the Ombay Passage, where the track joins the northern route by the Strait of Salayer.\* The landmarks on this part of the route are highly conspicuous. The peak on the east end of Lombok is visible at an immense distance, and it is a useful mark for vessels passing along

---

\* Flat Island, (one thousand and eighteen miles from Singapore,) lying to the north of Sumbawa, in  $8^{\circ} 8' S.$  latitude and  $117^{\circ} 23' E.$  longitude, is visible from the deck of a ship at the distance of sixteen miles. As its summit is nearly level, it is not always easily distinguished at night.

The Shoal of Maria-Reygersbergen, (a Dutch shoal, doubtful on the Chart No. 926 of the French Hydrographic Bureau,) which lies northwest of Flat Island, in  $7^{\circ} 56' S.$  latitude, was examined in 1825 by a Dutch cruiser, who placed it in  $7^{\circ} 51' 30'' S.$  latitude, so that the passage between Flat Island and this shoal would be about sixteen miles wide.

The great Mountain of Timboro, on the north coast of Sumbawa, is thirty-five miles to the east of Flat Island. It is an excellent landmark. (On the Chart No. 926, this mountain, called Tombara, is only twenty-four miles east of Flat Island.)

Bima (one thousand one hundred and eight miles from Singapore) is a Dutch settlement, situated in the southeast part of a deep bay on the north coast of Sumbawa. It may be considered as the capital of the island.

The double-peaked volcanic island which lies close to the northeast extreme of Sumbawa, is a noted landmark. (It is probably the Island of Goonong-Apee that Earle speaks of.) The northern peak is an active volcano.

Rusa-Lingit (one thousand three hundred miles from Singapore) is also an excellent mark, being high and steep-to. A reef, called Bangalore Shoal, had been placed on the charts about twenty miles to the northwest of this island. It is now pretty well ascertained that the *Bangalore* must have been wrecked on Angelica Shoal, which lies thirty miles to the northeast of Rusa-Lingit, (Rusa-Linguette of Chart No. 926 of the French Hydrographic Bureau. The Angelica Shoal is not laid down on that chart.) H. M. sloop *Haai* ran aground on this bank in December, 1846, but she succeeded in getting off. When aground, Iron-head (the northeast extremity of Flores) bore  $S. 63^{\circ} 30' E.$ ; Llimandiri Peak,  $S. 52^{\circ} E.$ ; Lobetobie Peak,  $S. 32^{\circ} E.$ ; Rusa-Linguette Peak,  $S. 30^{\circ} W.$ , (by compass,) and latitude observed  $7^{\circ} 48' 30'' S.$  Earle gives several other bearings taken by the sloop. Some of these bearings appear to be wrong; but three of them intersect twenty-four miles from Rusa-Linguette. Angelica Reef seems about four miles in extent, and is divided by two channels running north and south; in the center are some rocks above water.

Iron Cape (Tanjong-Bunga, or Cape of Flowers) is a high, bold promontory, forming the northeast extremity of Flores. The chief settlement is at Laruntuka, in the strait which separates Flores from Sodor and Adenara. This spot has been recommended as a coal depot.—G. W. EARLE.

the islands east of Java. The northern shores of these islands are generally bold, and steep to, with no soundings a mile off shore. The shoals laid down in some of the charts off the north coast of Lombok, marked *doubtful*, have been repeatedly sought for without success by Dutch cruisers, so that it may be safely said that they do not exist."

Northern track  
in Java Sea.  
Solombo.

When clear of Carimata Passage, having taken the northern route to go east in Java Sea, steer for the group of Solombo, or Nuso-Lombo, (seven hundred and eighty-two miles from Singapore.) The principal island, Great Solombo, is about twenty miles in circumference, consisting in a hill of singular form, with a road, level summit. Passing to the south of Great Solombo, at a distance of ten miles, an east course leads up to Point Layken, the southwestern extremity of Celebes.\*

Bonthain Hill.

"When abreast of Bonthain Hill, the center of the channel between Middle and South Islands in Salayer Strait should be brought to bear due east before steering for it, in order to pass to the north of Mansfield Bank, which is said to have only three and one-half fathoms water upon it in some places.

---

\* At a distance of one hundred and fifty miles to the eastward of Solombo the soundings increase to sixty, one hundred, and one hundred and thirty fathoms; but when to the southeast of the rocks called the Hen and Chicks, they decrease suddenly to fifteen and sixteen fathoms; after which they become variable; in some places there is no bottom until near the Point of Celebes. These overfalls are startling to strangers, though there is no real danger in the route that crosses the banks, for it has been carefully explored.

In clear weather Lumpo-Batang, or Bonthain Hill, which is an immense mountain with a rounded summit, will be perceived before the low lands. It is usually enveloped in clouds.

Tauakeke, a little island off the southwest extreme of Celebes, is low and level, and may be seen at a distance of fifteen or twenty miles. The channel between the island and the mainland affords all the year round excellent anchorage in eight or nine fathoms.

Near the south coast of Celebes the soundings increase gradually from the shore, which may be approached with safety, as the water is sufficiently clear to show any danger that may exist. Bonthain is a Dutch settlement; there is anchorage in six and a half fathoms, with the flag-staff northeast, and the extremes of Celebes E. by S.  $\frac{1}{4}$  S. and S. by W.  $\frac{1}{4}$  W.

Bulu-Kamba, also a Dutch port, lies fifteen miles east of Bonthain. The anchorage is preferable to that of Bonthain during the strength of the easterly monsoon, as it is more sheltered; but the latter has the advantage during the westerly monsoon.—G. W. EARLE.

"Salayer Strait (1,139 miles.) The most frequented track through the strait lies between Middle and South Islands, the channel being four miles wide, and clear of dangers. There are passages through the other channels, which, although sometimes used by the country vessels, have not been thoroughly explored. To the eastward of this strait, and throughout the Moluccas, the westerly monsoon is the fine season, this part of the archipelago being supplied with moisture by the rain-clouds brought from the Pacific by the easterly winds which prevail from April to September inclusive. Salayer is also the eastern boundary of the Great Asiatic Bank in this latitude, for after passing through the strait the sea becomes unfathomable, and continues so until the Great Australian Bank is reached. Salayer Strait.

"When clear through the strait, an east course may be continued until the high peak of Kambyna bears northwest, when S. E. by E. leads direct to the passage between Ombay and Pulo-Kambing. The only land near this part of the track is Hagedis or Lizard Island (1,272 miles,) which is low, but well wooded, and is visible from the deck at a distance of twenty to twenty-five miles."

The passage from Salayer Strait to Pulo-Kambing occupies ten days.

"Pulo-Kambing, or Passage Island, (1,520 miles southern track, 1,490 miles northern track,) is one of the most noted landmarks in this part of the world, being situated at a point where two frequented tracks cross each other. \* \* \* The island is about twenty-five miles in circumference, with steep, wall-like sides, crowned by a peak about 2,500 feet high. \* \* \* There is no anchorage near the island, owing to the depth of the sea, which is sometimes unfathomable at a distance of only two ships' length from the shore. Pulo-Kambing.

"The channel between Kambing and Ombay is eighteen miles, and that between Kambing and Babi, eight miles wide. Both are clear of danger, and may be adopted according to the convenience of the navigator.<sup>1</sup> \* \* \* \*

"The channel between Wetta and Timor is wide, and perfectly clear of danger. There are small fringing reefs on

---

<sup>1</sup> "Dilli, the capital of the Portuguese possessions in Timor and Solor, lies fifteen miles south of Kambing. It is a reef harbor, easy of access, perfectly sheltered, and exceedingly well adapted for a coal depot, should such be required."—G. W. EARLE.



the shores of both islands, but generally the sea is unfathomable at a distance of a quarter of a mile from the coast. The land on both sides is exceedingly high, and as there is generally a dense haze near the surface of the sea during the heat of the day, its outline is often more clearly distinguishable during the night.

"Pulo-Jaki (1,513 miles southern track, 1,553 miles northern track) is low and level, with a fringing reef. The strait between the island and the east point of Timor is narrow, but safe, with anchorage under the Timor shore."

Kissa, and the east end of Timor, form a channel eighteen miles wide, which is safe, as is also the channel between Jaki and Jeti.

To come out of Java Sea any of these channels may be taken that is most convenient.

"After leaving Timor, no land will be seen until Torres Strait is reached, unless it be deemed advisable to make Cape Wessel, a precaution by no means necessary, as the soundings decrease gradually as the strait is approached, thus affording sufficient warning to the navigator; while the latitude can always be obtained at least once in the twenty-four hours, for it has been generally remarked that during the westerly monsoon, (the only season in which the sun is likely to be obscured,) when the day has been overcast, the night has invariably been clear, or *vice versa*. For the first two hundred miles after leaving Timor, the sea continues unfathomable, but soon after attaining this distance, soundings will be struck in one hundred and thirty to one hundred and fifty fathoms on the Great Australian Bank, which decreases gradually to nine fathoms near the entrance of Endeavor Strait. There are several coral patches to the south of the track, about the parallel of  $10^{\circ}$ , but none of these have less than seven fathoms water upon them, with the exception of the Money Bank, which was discovered by the ship *William Money* in 1841, and was afterwards passed over by several of the ships employed in conveying her Majesty's eightieth regiment to India in 1844. The least depth on the bank is four and a half fathoms. Victoria Rock, the only danger north of the track until Torres Strait is approached, was discovered by a steamer of that name while on her voyage from Sydney to Singapore in 1843. The boat was sent to examine it, and only six feet water was found on the shallowest part. On approaching Torres

Strait, it will be well to get at once into the parallel of the western entrance of Endeavor Strait, ( $10^{\circ} 45'$  to  $10^{\circ} 50'$  S.,) in order to avoid some dangers said to exist to the eastward of Booby Island, called the Aurora and Proudfoot Shoals. These are laid down respectively in longitude  $141^{\circ} 7'$  and  $141^{\circ} 33'$  E. in the parallel of  $10^{\circ} 33'$  S., but on what authority is not distinctly known."

Navigators differ on the question of which should be preferred to enter Torres Strait by—Endeavor Strait, or the channel to the north of the Prince of Wales Group. The latter, of which we will speak hereafter, seems to be especially adapted to sailing vessels of great burden; for steamers, Endeavor Strait seems most suitable, particularly if a coal depot should be established, as is proposed, at Albany Island.

We will now return to Blackwood's directions.

"In steering in for Endeavor Strait from the westward in the parallel of  $10^{\circ} 50'$  S. the high land of Prince of Wales Islands will first be seen at a distance of twenty to twenty-five miles, extending from N. E. to E. N. E., and when at a distance of eleven or twelve miles, the northern Wallis Isle\* should be seen from the masthead, bearings S.  $75^{\circ}$  E., and Booby Island bearing N.  $5^{\circ}$  E.

"The northern Wallis Isle first makes as two detached islets separated about a ship's length from each other, the southern being the larger of the two.

"The southern Wallis Isle is low, flat, and woody; the highest trees being on its northern extreme.

"The northern and southern Wallis Isles are separated by a channel of five miles in extent, which is not safe to pass through, nor should it be attempted south of the Wal-

\* "Red Wallis, (2,493 miles southern track, 2,463 miles northern track,) one of the landmarks for the western entrance of Endeavor Strait, is a rocky island, about a mile in circumference, and very scantily clothed with vegetation, the red stone and earth of which it consists giving it the appearance from which it derives its name. Woody Wallis, which lies about a mile and a half to the south, is somewhat larger, and is covered with stunted trees. These islands are visible from a ship's deck at a distance of fifteen miles. From Red Wallis to the site of the proposed depot for fuel at Port Albany, the distance is thirty-seven miles, which will make the entire distance from Singapore to Cape York two thousand five hundred miles by the northern track through the Strait of Salayer, and two thousand five hundred and thirty miles by the southern track along the islands east of Java."—G. W. EARLE.

lis Islands, between them and the mainland, that channel being full of shoals.

"The soundings will be very regular in approaching the strait, gradually decreasing to five and a half fathoms, (sand,) which will be the depth at the extreme of the sandy spit, which runs out due west, six miles from the northern Wallis Isle.

"To avoid this danger, bring the northern Wallis Isle to bear E. by S.  $\frac{1}{2}$  S.; when at a distance of eight or nine miles from the isle, steer in a due east course; this will lead clear of the sandy spit running out from the northern Wallis Isle, on the extreme of which there are only two fathoms, and when two or three miles are run on this course, and northern Wallis Island brought to bear S. E., six and seven fathoms will be obtained, and the narrow part of the channel passed through. Cape Cornwall should now be seen bearing E. N. E.

"A careful eye will clearly make out the discolored water in the vicinity of the spit, and if there be much sea on, it will show itself by a heavy break; should it be necessary to tack when near the western extreme of this spit, keep the lead actively going, as the channel is there only two miles across and bounded by a sandy ledge on the northern side similar in features to the spit above named, only it is not so shoal, having three fathoms in one spot only.\* After entering a mile or two, the channel widens out to three or four miles.

"Having brought the northern Wallis Isle to bear south, steer a N. E. by E. course to pass a mile or two south of Cape Cornwall.

"Endeavor Strait is perfectly clear of sunken danger†

---

\* This bank, on which the soundings vary from two and three-fourths fathoms to two fathoms, projects from the west coast of Prince of Wales Island, and runs out west in a point as far as the extremity of the bank of northern Wallis Island, and forms with the northern edge of the latter the west entrance to Endeavor Strait. It is called *Rothsay Bank*. Endeavor Strait may also be entered by bringing Cape Cornwall, known by the peaked hill on its extremity, to bear N. 78° E. (English Chart No. 1748.)

† Captain Mackenzie shows that there are four sunken rocks in this strait, as well as a rock under water situated between Entrance Island and the little island called Woody Island, one of those that form the east coast of the channel of Entrance Island. These rocks were seen by the ship of war *Rattlesnake*, subsequently to Blackwood's survey.

It will be well to point out their position nearly as laid down in Blackwood's Chart No. 1748, corrected in 1854. Southeast of Cape Corn-

or foul ground, having an average depth of from seven to eight fathoms, coral sand, all over the strait.

"The course from northern Wallis Isle to Entrance Isle is E. N. E., and the distance seventeen miles. Entrance Isle is the northernmost of the Possession Isles, and the passage south of this island is perhaps the best for sailing out of Endeavor Straits; it is full two miles wide on an average depth of nine fathoms, sandy bottom, and clear of sunken dangers. The two other channels between the southern islands of the Possession Group are equally safe and clear of shoals, although not quite so broad.

"Entrance Island may be known by having a high rounded hill on its northeastern extremity.

"The tides sometimes set through these channels with considerable strength, as much as five knots at the springs; the ebb tide setting to the N. E. and N. N. E., the flood to the S. W. and S. S. W., it being high water at full, and change at one o'clock, the rise of tide being nine feet six inches.

"Having passed out of Endeavor Strait by any of the passages above named, it is optional to sail through Torres Straits either by Raine's Islet beacon or by the route through the northern part of the strait going out by Darnley Island (lately surveyed by her Majesty's ships *Fly* and *Bramble*,) which is in every respect a safe and practicable passage in both monsoons, and has the great advantage of the ground being perfectly clear of sunken dangers."

We will now give the directions of Lieutenant Yule\* for crossing Endeavor Strait from east to west, after reaching Cape York, if this strait is preferred to Prince of Wales Channel, concerning which last we give some information on the following page.

"Coming from the southeast with a ship drawing more

than five fathoms, there are three spurs of rock, covered with five fathoms of water. The most distant is two and a half miles from the cape. Northeast of these rocks, and nearer the shore, is Eagle Rock, on which there is only one fathom of water. Near this there is a second spur, with two and one-quarter fathoms of water. Heroine Rock, on which there is one fathom, is about two and a half miles S. S. E. of Entrance Island. Finally a rock bearing the name of Gibson is one mile from this same island in the same direction; it has one fathom on it, and its position is marked as doubtful. It is apparent from this that it is necessary to navigate carefully in Endeavor Strait.

\**Mélanges Hydrographiques.*

than fifteen feet of water, it is necessary, after passing the channel between the Brothers and Albany Islands, to keep a good lookout for a rock situated nearly in mid-channel between Mount Adolphus and Cape York. (This rock, which was examined by an officer of the *Fly*, has four fathoms on it. Blackwood's Chart No. 1748 gives only three fathoms.)

"When this danger is passed stand on direct for Endeavor Strait, which can be entered by either of the three channels we have just mentioned. In these channels the least depth has been found to be four and one-third fathoms. Of these three channels I consider the most westerly the best, because it is the broadest, and because the depth varies from eight and three-fourths to nine and three-fourths fathoms, sandy bottom.

"To enter this channel the ship must steer west of the group of Possession Islands, of which the two most westerly are very near each other and thickly wooded. Having passed between these islands and a high, steep island to the west (Entrance Island,) a course S. 70° W. will fetch Wallis Islands; pass about two miles north of the most northerly of these islands, the one called Red Wallis, and when abreast of it the course will be W.  $\frac{1}{2}$  S. for eight miles, or till Booby Island bears N. by E.

"To keep clear of the great sand-bank of which we have spoken, which makes out from Red Wallis Island to the west, nothing south of this course must be made. When Booby Island bears N. by E. the vessel is clear of Endeavor Strait."

Prince of Wales  
Channel.

Another less direct channel, which Blackwood does not mention, is that of Prince of Wales, north of the islands of this name. This channel, which is particularly suitable for large ships, also leads to Cape York; to take it coming from the west, the vessel should pass north of Little Booby Island, and, avoiding the reefs east of it, should make for the channel, bounded on one side by Reef *d* and Northwest Reef, and on the other by Goode, Hammond, and Wednesday Islands, north of Prince of Wales Islands. Having doubled the last of these islands, the course is about S. E. by E. till on the meridian or West Double Island; then S. E. for Cape York; after which Torres Strait may be left, either by Bligh or Raine Island Channel.\*

\* See hereafter; King's directions for crossing Prince of Wales Channel, coming from the east.

"From Entrance Island\* steer N. 45° E. for thirty miles; this course will lead to a position four or five miles south of a small patch of black rocks, over an average depth of nine to ten fathoms coral sand and shells. These rocks (named Harvey's Rocks on chart) are fifteen or sixteen feet above water, and are bold to approach within a mile either way. Having brought these rocks to bear N. W., distance two miles, the course must be altered to N. N. E. for twelve miles, to steer between a cluster of low woody isles called 'The Sisters.'

Bligh Channel.

"It may here be observed, that the space of sea comprised by 'Harvey's Rocks,' 'Mount Adolphus,' 'The Sisters,' and the northern coast of Australia, is, for nearly thirty miles each way, quite clear of dangers, and if the night be coming on and it be an object to avoid anchoring, a ship may safely heave to for the night after having passed through Endeavor Straits nine or ten miles, or make tack every three or four hours in the space above described, which has been closely sounded and surveyed.

"These low woody isles, called 'The Sisters,' are separated by safe channels of from three to four miles in width, any of which may be passed through. The widest is the channel between the 'Northern Sister' and 'Long Island,' which may be distinguished by its having a low, small 'sandy islet,' latitude 10° 6' 30" S., in the center of the channel, having a few small bushes on it. Pass in; either north or south of this islet, avoiding a sunken patch which lies due east, nearly two miles from it, and is the only sunken danger we discovered in the strait, and steer an E. N. E. course for a low island covered with cocoa-nut trees on its northern end. Pass to the northward of this island in a clear channel nearly four miles wide, between it and a low small island called Dove Island, and then shape a N. E. by N. course, which is now the direct channel, leading between the northern islands of the strait and the great reef which here surrounds the southern coast of New Guinea.

The Sisters.

"In the absence of a chart it is difficult now to describe the track, as numerous low woody isles will appear. It may suffice to say that steering a N. E. by N. course from Dove Island for thirty-five miles all sail may be carried, and the channels between the islands sailed through with perfect confidence, recollecting in all cases that the northwest sides

---

\* Blackwood's Directions.

of the islands are bold to approach within half a mile, the reefs which surround these coral islets always extending from their E. S. E. and S. E. extremes.

Stephens Is- land. "Having run thirty-three miles in this course over an average depth of nine to ten fathoms sand, varying the course a little either way, according to the tide, Stephens Island, latitude  $9^{\circ} 31'$  S., will be approached, and the mouth of the strait will open, the depth of water being now seventeen fathoms. Stephens Island may be known by its being rather higher than the rest of these low, woody islets, and being separated from another small islet, called Cambles Island, by a channel of two miles in width, which is not to be attempted. If the weather be at all clear, Darnley Island, which is 580 feet high, will now be seen. It bears E. S. E. from Stephens Island, distant thirteen miles, and should water be wanted, or it be an object to obtain anchorage, good shelter during the S. E. trade will be procured in Treacherous Bay, on the northwest side of the island, the depth of water being eleven fathoms, coarse sand; half a mile from the shore.

Route when coming from the east to cross Torres Strait by Bligh Channel. "A ship intending to sail through by this passage should (after having passed Cape Rodney and the southeast part of New Guinea) place herself in the parallel of  $9^{\circ} 15'$  S. latitude, on which latitude a west course will take her well to the northward of the Eastern Fields and Portlock Reefs and into the best channel for entering the strait.

Eastern Fields and Portlock Reefs. "The Eastern Fields, discovered and laid down by Captain Flinders, are a detached mass of reefs, the northern part of them lying in  $10^{\circ} 2'$  S. latitude, and  $145^{\circ} 45'$  E. longitude; and Portlock Reefs are a similar group, the northern extreme of them lying in  $9^{\circ} 26'$  S. latitude and  $144^{\circ} 58'$  E. longitude, leaving a clear passage of thirty-four miles between Portlock Reef and the Great Barrier Reef, which may be said to terminate in the same parallel, viz:  $9^{\circ} 26'$  S.

"In the neighborhood of Portlock Reefs, soundings of fifty-eight to sixty fathoms will be obtained on a coarse, corally bottom, and the soundings gradually decrease to forty-five and forty fathoms as Anchor Cay is approached.

Anchor Cay. "Anchor Cay is a small sand-bank on the northwest extreme of a detached reef; it is in  $9^{\circ} 22'$  S. latitude, and bears N. E. by E. twenty-four miles from Darnley Island, which is distinctly visible from it in clear weather. Con-

jointly with another sand cay of the same description, (bearing from Anchor Cay E. S. E three miles,) it forms the southern boundary of Bligh Entrance. Each of these sand-banks is surrounded by a reef running a good mile to the southeast from them; they are safe to sail between, and are separated from the north extreme of the Barrier by a clear passage seven miles in width.

“Bramble Cay, which forms the best guide for Bligh Entrance, bears N. W.  $\frac{1}{2}$  N., nineteen miles from Anchor Cay. It is a sand-bank twelve or fifteen feet above low-water mark, visible seven or eight miles from the mast-head, having a reef extending a mile from its E. S. E. extreme. This sand-bank is covered with coarse, scurvy grass, and is the resort of numberless sea birds. A detached patch of black rocks, twelve or fifteen feet above water, bears S. W. by W., three miles from the sand-bank, leaving a clear passage between them and Bramble Cay. These rocks are bold to approach within a mile.

Bramble Cay.

“From a position six or seven miles from the southward of this sand-bank (if the weather be at all clear) Darnley Island should be seen S by W, distant twenty-eight miles from Bramble Cay; it is five hundred and eighty feet high, and makes as a rounded knob from the above position. The hill of Darnley Island is in  $9^{\circ} 35' 20''$  S. latitude and  $143^{\circ} 50'$  E. longitude. A long reef, having a sand-bank at its extremity, runs out northeast nine miles from the island. To the northward of, and detached from, this reef are three separate coral patches, the two southern of which have sand-banks on them showing at half tide, and with clear passages between them. These detached passages should be carefully looked out for, as they here narrow in the channel; they always break, but at high water the northern patch is covered; it lies seven miles north of the sand-bank on the extreme end of the reef that runs out from Darnley Island, or distant nearly sixteen miles, bearing N. N. E. from the island itself, leaving a clear channel of fourteen miles between it and Bramble Cay, from which it bears S. by W.

Darnley Island.

“The southern part of the entrance between Bramble Cay and this northern patch should be carefully avoided at night, there being ample room for a ship to heave to or anchor in twenty-two fathoms, coral sand, in any part of the channel north of Bramble Cay, between it and the coast of



New Guinea, which is distant from Bramble Cay thirty miles at its nearest point.

"Care should be taken not to come under six fathoms when standing in toward the New Guinea coast, which will lead clear at a distance of seven or eight miles from the land.

Tides.

"This coast is low and just visible from a ship's deck in parts, when in five fathoms. The flood tide sets in near Bramble Cay from the N. E. and E. N. E., running at the springs at the rate of nearly two knots per hour, the ebb in the opposite direction running with greater strength; but as the coast of New Guinea is approached the flood tide assumes a more northerly direction, setting along the land to the N. W. and N. W. by W.

"It may be considered that a westerly set of at least one mile per hour may be allowed for when steering in for the mouth of Torres Strait, and after a gale it may exceed that rate.

"The ebb tide did not appear to exert any influence when fifteen or twenty miles from the mouth of the strait, the ship being solely affected by the prevailing westerly current. Having passed Bramble Cay the flood tide will be found to set to the W. and W. S. W., being diverted to a more southerly direction by the great reef off the southern coast of New Guinea.

"About the centre of the strait, in the neighborhood of Dove Island and the Sisters, the flowing tide sets to the N. W. and ebbs to the S. E. The average rise and fall all over the strait not exceeding ten feet at the highest springs.

"It is high water at Darnley Island at the full and change of the moon at 9h. 30m., the tide rising nearly ten feet. On the south coast of New Guinea it is high water at 10h. 30m., the rise being fourteen feet. At the Sisters, in the centre of the strait, at 11h. At Cape York at 12h.; and at Wallis Island, the west extreme of Endeavor Straits, at one o'clock, the tide running full two hours longer in the stream than by the shore.\*

Route from  
Cape York, leav-  
ing the Great  
Barrier by the  
Raine Island  
Channel.

We shall confine ourselves here to pointing out the routes that may be pursued, when, having reached Cape York by Endeavor Strait or by Prince of Wales Channel, it is preferred, instead of taking Bligh Channel, to leave the Great Barrier by the Raine Island Passage. The first part of this

\**Mélanges Hydrographiques.*

route, as far as Cape Grenville, is the last part of the one given in King's directions for going from Sydney to Cape York by the inner route, and we shall describe it fully hereafter, giving Captain King's directions; the other part of this route will be described by Captain Blackwood, who gives the directions for sailing from Raine Island to Cape York. Neither of these officers having specially described the route from Cape York to Sydney or Raine Island, we must limit ourselves here to some information concerning these routes, to be completed hereafter by the directions given for pursuing these same routes in the reverse way.

When three-fourths of a mile north of York Island, the course is E. S. E. to pass south of Mount Adolphus Islands and north of the Albany Islands, keeping a good look-out for the rock with three fathoms on it between these islands, and leaving to the east the Brothers Islands. Having brought the most northerly of these islands to bear east, or the northwest point of Albany Island west, the course is S. S. E.  $\frac{1}{2}$  E. to pass to the Eastward of Turtle Island and Shadwell Point, leaving on the east the reefs Z and X, continuing on the same course, (S. S. E.  $\frac{1}{2}$  E.,) and leaving on the west Gilmore Bank and on the east Cairncross Island. The passage is between this latter and Busby Island. Thence steer to pass eastward of and near the Hannibal Islands, leaving to the east some sandy islets, the Boydong Cays and the reefs W and V, and passing north or south of Bird Islands; then take, as may be convenient, the North Channel, north of the reef and Cockburn Islands, or the Pollard Channel, which is south of them. These two channels meet again south of the Middle Banks, from whence shape a course for Raine Island. The Great Barrier may be left by passing either north or south of this island. As we have said, we do no more than point out these routes, because we do not wish to fill up the blanks left in the directions of King and Blackwood by taking their reverse routes, to be given hereafter.

On leaving Cape York, when between the Brothers and Albany Islands, the Middle Passage may be taken to reach the Raine Island Passages, for which purpose follow in the reverse order the directions given by Blackwood for crossing this channel coming from the east. The Middle Passage falls into the North Channel and Pollard's Channel near the Middle Banks.

Such are the routes to be pursued, when coming from the west, for passing through Torres Strait. They allow the choice of the inner or outer route in going to the ports of the east coast of Australia.

Routes from  
Sydney to India.

Vessels leaving Sydney or the ports of the east coast of Australia for the ports of India during the S. E. monsoon (from April to October) will gain more by going through Torres Strait than Bass Strait, because at this period of the year strong west winds prevail on the south coast of Australia, which make the voyages very long, and render the doubling Cape Leeuwin very difficult.

Inner route.

Passing through Torres Strait, there are two routes that may be taken: the inner route, coasting inside the reefs of the Great Barrier, the east coast, and the northeast coast of Australia; and the outer route, which is outside the Great Barrier. In taking the inner route, says Captain Blackwood, the directions of Captain King must be strictly followed, for, considering the physical condition of these seas, it is not impossible that there are steep coral banks at no great distance from the tracks that have been sounded out. We will now give these directions.\*

From Sydney to Cape Sandy, where King's description commences, the navigation is attended with no difficulties beyond those usually encountered in an open sea without dangers. The following is quoted from Captain King:

"Having hauled round Breaksea Spit (see Flinders' Chart, Sheet III) in the evening, it would perhaps be dangerous to steer on through the night; after running, therefore, to the west-northwest for five or six leagues, bring to until daylight; but, if the day be before you, the course from the extremity of the spit is W. N. W.  $\frac{1}{4}$  W. for about a hundred miles. You will then be about twenty miles from Cape Capricorn; on your way to which you should pass about three miles within Lady Elliot Island (1,) and also within the southernmost islet of Bunker Group (2,) by which you will see how the current has affected your course, and you can act accordingly; if it has set you to the northward, you may pass on either side of or through the islands without danger. After making Cape Capricorn, you may leave it at a convenient distance, and, directing your course about N. W. by

---

\* *Nautical Magazine*, (1834,) p. 68. These directions are only for the inner route, and the descriptions of the ports given by Captain King are omitted.—Remarks by the Editor of the *Nautical Magazine*.

N., pass either within or without the Peaked and Flat Islands off Port Bowen (4;) then, steering for the Percy Group (6,) pass between the 2d and 3d Northumberland Islands (5.)\*

"After passing the latter, avoid a low dangerous rock that bears from it N. 8° E. five and three quarters miles, and from 1st Peak S. 85° W. To avoid this in the night, pass close round No. 3, which is high, and of bold approach.

"The channel is safe on either side of the Percy Isles, but that to the westward of them, being better known, is recommended as the safest. Following either the *Mermaid's* or *Bathurst's* track † will carry a ship round the projections of the coast as far as Cape Grafton (35;) as far as which, if the weather be fine, there can be no danger of proceeding through the night; but it must be recollected that at Cape Grafton the coral keys of the Great Barrier Reef approach the coast, and consequently the channel becomes contracted.

"On reaching Fitz-Roy Island (36,) round it a mile off shore; and when its north end bears west, steer N. W.  $\frac{1}{2}$

\* On King's chart these islands are numbered 1, 2, 3, 4, 5, 6, 7, 8, &c.; he has made use of the same system for the numerous groups of islands lying hereabouts; and he also designates many islands or reefs by letters.

† These two tracks are laid down on King's Charts 1075 and 1076; they are as follows: The two tracks start from Percy Islands. From these islands, one passes east of the Beverly Group and Double Island; then west of the Island *k* 2, marked by a small peak; from this island it passes east of the Three Rocks, then east of the Islands *l*, *l* 2 of Cumberland Group, round which it passes on the east, leaving to the eastward, however, the little islets lying opposite to the largest of these islands, which rises to the height of 1,441 feet. The second route, starting from the Percy Islands, passes between Pinepeak Island No. 3, visible at twelve or thirteen leagues, and the Island No. 5 of the Percy Group; then east of the Islands *k* 1, *k*, and *k* 2, leaving to the eastward the Islands of *k* 4 $\frac{1}{2}$  and *k* 4 of Cumberland Group; it passes then some miles to the westward of the uncovered sand-bank seen by Flinders in 1802, and passes round to the east of the whole group of the Northwest Cumberland Islands. From the Cumberland Islands to Cape Bowling Green the two tracks approach each other, and both pass to the south and the west of Holbourne Island, and then at a little distance from Cape Bowling Green. From this cape to the Palm Islands, the two tracks are direct. They pass afterwards to the westward of the group of Palm Islands, then they approach each other north of this group; they both pass west of the Prince Regent Sand-bank and Reefs, and east of all the islands that line the coast as far as Frankland Islands. One of the tracks passes east, the other west of these islands, and afterwards they take a straight course to Fitz-Roy Island, situated south of Cape Grafton. The first passes east, the second west of this island.

N. for thirty-five miles; you will then be a league to the southeast of a group of low isles: should it be night when you pass them, come no nearer to them than fourteen fathoms. In steering this course, great care should be taken not to go too much to the eastward, to avoid the reef which was seen by *Tamar*.

"If the moon be up, and the weather fine, the islets will be readily distinguished, but it would be more prudent to wait for daylight. This course will carry a ship over two of my tracks,\* and the soundings will be in seventeen, eighteen, and nineteen fathoms. From the low isles, direct your course for the Hope Islands (37,) which bear from the former N. 18° W. thirty-eight miles; but the course had better be within that line, to avoid some reefs in latitude 15° 51': pass, therefore, within five miles of Cape Tribulation, whence a direct course may be steered on either side of the Hope Isles. The better route will be within the Western Hope, and along its reef, at the distance of three-quarters of a mile, by which you will avoid Reef *a*. When you are abreast of its north end, a N. by W. westerly course, for twenty-eight miles, will carry you to Cape Bedford (40,) which may be rounded at from one to three or four miles. You will see in your way, at three and a half miles from the north end of the Hope Reef, Reef *b*; and at fifteen miles from it you will be abreast of *c*; and five miles further on you will pass Captain Cook's Turtle Reef (43,) which has a dry sand at its north end. These three reefs will be to the eastward of your course.

"The current sets to the N. W., so that your course must be directed accordingly. In coasting along the shore, you will discern the summits which are marked on the chart. The high conical hill on the south side of the entrance of Endeavor River (38) is Mount Cook; bearings of which, crossed with the summit of Cape Bedford, or any of the particularized summits or points, will give the vessel's place; by which the effects of the current, which is generally very slight, will be ascertained. On one occasion we found a current in the space between the Endeavor Reef and Turtle Reef, of two miles an hour, to the northwest.

"Being off Cape Bedford, and steering to the N.  $\frac{1}{2}$  W., you will see the Three Isles (44) ahead; steer between them and the low wooded island, and direct your course round

---

\* Captain King.

Cape Flattery (41,) and Look-out Point (42,) in order to anchor under the Turtle Group (49,) unless you have time before dark to reach the Islands 4, 5, or 6, of Howick's Group (52,) under which anchorage may be found. In rounding Lookout Point, do not come within two miles and a half of it, to avoid a reef that is on Captain Cook's chart, which, however, we did not see; it lies a mile and a half north from the peaked hill at the extremity of the point.\* You may pass on either side of the Turtle Group, or between Lizard Island (46) and Eagle Island (48,) but the latter course is not to be recommended; first, because the wind is generally fresher as you increase your distance from the shore; and secondly, because the run is ten or twelve miles longer. There is good anchorage under the northwest side of the Peak on Lizard Island.

"From the Turtle Group steer N. W. by W.  $\frac{1}{2}$  W. until you see the hillock at the southeast end of No. 1 of Howick Group; pass inside it, and within a mile of 2 and 3, and between Islet 4 and Cole's Islands (50,) also inshore of 6, and of the dry sands *s*, *t*, and *u*. The *Mermaid's* track will direct the course to Cape Melville (56.) If the day be advanced when abreast of 6, of Howick Group, anchorage had better be secured under it, as there is none to be recommended between it and Cape Flinders (59.)

"Upon rounding Cape Melville, the Islands of Flinders Group (58) will be seen, and as soon as you have passed between the stony reef that projects off the cape (the extremity of which bears from it by compass N. W. by N., and from Pipon Island S. W. by W.  $\frac{1}{4}$  W., nearly,) and the reef that surrounds Pipon Island, (57,) direct the course for the extremity of the islands to the westward, which is Cape Flinders; the course and distance to it is W.  $\frac{3}{4}$  S. nearly thirteen miles, leaving a low, woody island on the starboard hand.

"His Majesty's sloop *Satellite*, in 1822, grounded upon a small reef, *a*, bearing N. by E. (easterly) from the extremity of the cape, distant about two miles, but as a ship may pass within a stone's throw of the cape this danger may be easily avoided. The best anchorage to leeward of Cape Flinders is under the flat-topped hill, at a third of a mile

---

\* On King's chart there are also two sand-banks, bare at low water, between which the track passes. These two banks bear E. and N. E.  $\frac{1}{4}$  E. from Point Lookout, two miles and two and a half miles distant.

from the shore, in ten fathoms, muddy bottom. In hauling round the cape, avoid a shoal which extends for two cables' length from the shore on its western side.

"If daylight will allow of time to run fifteen miles further, the ship may proceed to anchorage under the Reef *d*; but in this neighborhood anchorage may be obtained under any of the reefs or islets between this part and Cape Grenville, for the bottom is universally of mud; and, by anchoring with the body of the reef bearing southeast, the vessel is sufficiently sheltered from the sea, which is generally smooth.

"On leaving Cape Flinders, steer W.  $\frac{3}{4}$  N. for about twenty-three miles, leaving the Reefs *c* and *g* to seaward, and *d*, *e*, and *f* to the southward of the course; then haul up about N. W.  $\frac{3}{4}$  N., and steer within the Reef 1 and Pelican Island (63,) and to seaward of the Claremont Islands, (64,) 1 and 2, which are low and woody.

"When abreast of Island 2, the southwest end of the Reef *m* will be seen, which should be passed at from one to two miles, and the course N. by W.  $\frac{1}{4}$  W. will carry you to Islands 4 and 5, which you may pass on either side; the channel between them is also quite safe. If you take the latter course, steer north, within the Reef *o*, and then close within 6, to avoid a low rock that covers with the tide. Having passed this rock, which is marked on the chart, steer for 7, and pass within one mile of it to avoid the shoals that extend off Cape Sidmouth, (66.) Hence the course is N. N. W. toward Night Island, (67;) and, when abreast of it, steer N.  $\frac{1}{2}$  W. until near the covered shoal *r*, when the course may be directed within Sherrard's Islets (68) and Reef 10, (on which there is a sandy islet covered with some bushes,) and then steer round Cape Direction.

"Hence a course N. N. W.  $\frac{1}{4}$  W. will carry you within the Reefs *y*, *z*, *a*, *b*, and *c*, and without the rocky islet that lies off Restoration Island, (70;) continuing this course for about five miles beyond Cape Restoration, you will see the long Reef *e*, then steer northwest along its edge, which extends until you are abreast of Fair Cape, (71,) where it terminates with a very narrow point. Thence steer N. W.  $\frac{1}{2}$  N.,\* and pass between the two easternmost Piper's Is-

\* These routes are given by King in his directions. On the chart, the track passes two miles east of Restoration Island, and thence the course N. W. leads straight to Piper Islands. This is the course of the

lands (74) and the Reefs *h*, *i*, and *k*; then on either side of *l* and *m*, inshore of Haggerston Island (76,) and round the outermost of Sir Everard Home Group, (77.)

“The anchorages between Cape Flinders and this are so numerous as not to require particular mention. The north-west end of every reef will afford shelter; but the anchor should not be dropped too near to them, because the tide sweeps round the edge with greater strength than it does at half a mile off, and the bottom is generally deeper. If the day is advanced and the breeze fresh, Night Island should not be passed, because the anchorages between it and Piper Islands are rather exposed, and a vessel getting under way from Night Island at daylight will easily reach Piper Islands or Margaret Bay before dark.

“Margaret Bay (77) is round Cape Grenville; the anchorage, being fronted by Sunday Island, is well sheltered; it is a safe place to stop at. Anchor in six fathoms, with the island bearing southeast.

“In passing round Sir Everard Home Islands (77) steer wide from them, to avoid the tide drifting you towards the group, for it sets to the northwest across the course. The course is then about N. W.  $\frac{1}{4}$  W. to the Bird Isles, (80,) and thence to the Reef *v*, about N. W. by N. The better and more direct plan is to pass within *v* and *w*, (there is, however, a safe channel between them,) and when abreast of the west end of the latter the course and distance to Cairncross Island (82) is N. by W.  $\frac{1}{2}$  W. about eighteen miles.

“In taking these routes, leave on the port hand the Hannibal Islands, and on the starboard the Boydong Keys.

“There not being any very good anchorage between Cairncross Island and Cape York, it would be perhaps better to anchor under it for the night, in about fourteen or fifteen fathoms, mud, the island bearing southeast, but not nearer than half a mile, because within that distance the bottom is rocky.

“Leaving Cairncross Island, steer N. N. W.  $\frac{1}{4}$  W. until Escape River (84) is abreast of you, when look out for Reef

---

track laid down on the chart. The track N. 40° W. leads much farther from Reef *e*. According to the Chart No. 1076, it would be dangerous to make more than four miles on this course without returning to the north course to run along the western edge of Reef *e*, on account of a bank which rises above water four miles to the westward of this reef.



*a*; steer within it about N.W. by N., which will take you inside the covered reef *z*. Your course then must be round the Albany Islands (87,) and hence N.W. by N. for *a*, which is a rocky islet that may be seen from abreast the Albany Isles.

Prince of Wales  
Channel.

"The passage through the Possession Isles (90) and Endeavor Strait (91) is not to be recommended for a large ship, on account of the shoal water that extends from Wallis Isles toward Shoal Cape; the route round the north end of Wednesday (92) and Hammond Islands is preferable. Upon passing Reef *a*, Wednesday Island will be seen; in steering toward it, avoid standing too close to the rocky islet that is abreast of the strait between it and Horned Hill, as some sunken rocks stretch off it for about a quarter of a mile;\* steer round the north point of Wednesday Island at half a mile, then W. by S.  $\frac{1}{4}$  S., which will carry you to the northward of the rock off Hammond Island. From this rock steer S. W. by W.; and when abreast of the southwest end of Hammond Island, haul toward a reef, to the southward of the course, on which you will see some dry rocks, which you may pass within half a mile; by so doing you will avoid Reef *d*, which is generally, if not always, covered; the fairway of this channel is seven and eight fathoms deep.

"When the summit of Good Island (93) bears S. W. by W., steer W. by S. southerly for Booby Island† (95,) by which you will avoid Larpent Bank, and when you are past it, you are clear of the strait. Hence you may steer W.  $\frac{3}{4}$  S. through the night, on which course you will very gradually deepen your water. To the northward of the two tracks to the westward of Booby Island are some coral reefs, the positions of which are not correctly ascertained.

"Being fully convinced of the great advantage and superiority which the inner route possesses over the passage

---

\* On the Charts Nos. 1076 and 1748, these dangers, which terminate at the east by Strait Rock, extend as far as two miles to the eastward of the meridian of Horned Hill Point.

On the same chart, No. 1748, the hidden rock to the east of Horned Hill Point is called *Duym* Rock, and not *Strait* Rock, as we give it. To the eastward of Duym Rock there is a bank having two and a quarter fathoms on it in its shoalest part. The east part of this bank is more than three miles from Horned Hill Point. Strait Rock, on the corrected chart, No. 1748, is a visible islet, lying in the south part of Prince of Wales Channel at its eastern entrance.

† On this island there is a letter-box.

without the Barrier Reefs, which for many years has been generally adopted, I am anxious to prevail upon navigators bound through Torres Strait to give it a trial; the result of which I feel assured will be in favor of its being ever afterward used.

"The season in which the strait can be passed commences with the month of April, and ends with October; that is, during the S. E. monsoon. The westerly monsoon, besides being a foul wind, is accompanied by unsettled, gloomy weather and heavy rains, and frequently by strong gales, against which it is impossible to make a voyage without great delay and loss of time.

"The passage up the northeast coast is not affected by the monsoons. The S. E. trade blows up the coast during the whole year, with little variation, save that during the months of June, July, and August, it is occasionally, although rarely, suspended by northeasterly winds, with thick rainy weather. To the southward of Cape Grafton, (latitude  $16^{\circ} 51'$ ), this interruption is of more frequent occurrence. Still, however, the prevailing wind to the northward of Breaksea Spit is from S. E., and there will be no difficulty in making an expeditious passage."\*

Such are the directions of Captain King for the inner route. We will now give those of Captain Blackwood for the outer route, when making for the Raine Island Passages.

"Vessels, after leaving Sydney, are recommended to make the most direct course to approach the Tropic of Capricorn—where the outlying dangers may be said to commence—on the meridian of  $156\frac{1}{2}^{\circ}$  E.; it being presumed that the vessel is navigated by chronometers, with well-known errors and rates, there can be no object in sighting either Cato Island, Bird Islet, or Wreck Reef.†

"The Tropic of Capricorn having been crossed somewhere between the meridians of  $156^{\circ}$  and  $157^{\circ}$  E., the outer route through the Coral Sea will be divested of many of its terrors, if the vessel is rigorously kept where the tracks of other vessels appear most crowded on the chart, passing to the eastward of the supposed Australia and Kenn Reefs, and to the northeastward of Alert Reef, Diana Bank, and Osprey Reef.

"Having crossed the tropic in about longitude  $156^{\circ} 30'$  E., run to the northward on that meridian, until in latitude

---

\* *Nautical Magazine.*

† See Admiralty Charts of Australia.

20° 30' S., when the vessel will have passed sixty miles to the eastward of Wreck Reef, and from twenty to thirty miles to the eastward of the doubtful positions of the Australia and Kenn Reefs.

"From latitude 20° 30' S., longitude 156° 30' E. steer N. W.  $\frac{1}{4}$  W., until in latitude 15° S., longitude 151° 30' E., when a direct course, W. by N.  $\frac{1}{4}$  N., may be steered for the Great Barrier Reefs, at Raine Island. In making these courses some allowance must be made for the prevailing northwesterly current, especially when approaching the barrier, and a careful lookout must be kept for the Alert Reef when passing it, as its northern extremity is not clearly defined.

**Raine Island.**

"Raine Island, which may be easily known by the substantial tower built on it, is situated in the center of the opening between the northern extreme of the Great Detached Reef, and the projecting point of the Great Barrier Reefs N. E. by N. eight and a half miles from it; there is a clear channel on either side of the island, the southern being three and a half miles, and the northern nearly two miles broad. The island, which is of coral formation, is nearly three quarters of a mile in circumference, and twenty feet above the low-water level; it is surrounded by a coral reef closely fringing the northwest end, but extending one and a fourth mile from the southeast extreme of the island; this reef is in most parts dry at low water, and entirely so at springs.

"As no bottom could be reached with one hundred and twenty-five fathoms of line in any part of the opening, nor close up to the lee of the Raine Island, it affords no anchorage.

**Beacon**

"Raine Island having become the most important point for entering Torres Strait from the outer route, it was considered by Captain F. P. Blackwood the most eligible site for a sea mark. A substantial beacon of stone was accordingly erected, in 1844, under his direction, on the southeast point of the island. The beacon is a circular tower, surmounted by a wooden dome with a ball on the top; the whole is sixty-four feet in height, or seventy-four feet above low-water mark, and the tower is thirty feet in diameter at the base. It was painted with alternate red and black vertical stripes, and in clear weather is visible eight or nine miles from the deck, and ten or twelve miles from the mast-

head of a vessel. Its position is in latitude  $11^{\circ} 35' 50''$  S., longitude  $144^{\circ} 2' 20''$  E.

"An ample supply of provisions has from time to time been lodged in the chambers of the beacon, for the relief of shipwrecked or other distressed persons; and an iron tank, capable of holding five tons, was placed at its base for the reception of rain-water from the roof. Supplies.

"Raine Island produces a bushy sort of plant, coarse grass, and a kind of spinach. Sea birds are incredibly numerous, and a great abundance of wholesome bird's eggs may be gathered at certain seasons of the year; turtle also frequent the island to deposit their eggs.

"As a general rule, vessels may anchor under the lee of most of the reefs and islands within the barrier during the prevalence of the S. E. trade-winds, (from March to September;) but it is not always safe to do so at the other seasons of the year, as heavy gales often come on to blow suddenly from the opposite quarter, when the northwest sides of those reefs and islands would naturally become dangerous lee shores. Anchorage.

"Her Majesty's ship *Fly*, during the survey, seldom experienced the slightest difficulty in weighing her anchor; but her tender, the *Bramble*, and especially the boats, suffered much in this respect; this can only be accounted for from the ground tackle of the former being sufficiently ponderous to break of the projecting irregular masses of coral, which the gear of the smaller vessels failed to do.

"It being presumed that Raine Island Entrance has been decided upon for passing through the Great Barrier Reefs from the outer route, and that the beacon on Raine Island has been plainly made out, steer for the Southern Passage, which is much wider and far preferable to the northern. Having entered the Southern Passage, and brought the beacon to bear N., distant about a mile, with the southern edge of Raine Island Reef at about half a mile off, steer S. W. by W.  $\frac{1}{4}$  W., carefully allowing for the tidal stream, as well as the current to the northward, and a run of nine miles from abreast of the beacon will bring the vessel into soundings, on the edge of the bank, passing at about half a mile to the northward of the northern extreme of the Great Detached Reef; the main body of the Great Barrier Reefs will then have been fairly entered.\* Directions for  
Raine Island En-  
trance and Black-  
wood Channel.

---

\* See Admiralty Charts of Australia.

Northern Pas-  
sage.

"Should a vessel be compelled to enter by the Northern Passage, she should haul up, so as to pass at about half a mile or two-thirds of a mile from the north side of Raine Island, and steer S. W.  $\frac{3}{4}$  S. for six or seven miles, or until the beacon bears N. E.  $\frac{1}{4}$  E.; then, by steering S. W. by W.  $\frac{1}{4}$  W., for about three miles, the vessel will be on the edge of the bank, in the position above mentioned, when entering by the Southern Passage. Great care is here necessary in making due allowance for the stream and northerly set; and the beacon must not be brought to bear to the southward of E., in order that the shoal patches, lying four miles to the westward of Raine Island, may be avoided.

"When the vessel has reached into soundings of twenty-five or thirty fathoms, in the entrance of Blackwood Channel, a good lookout from aloft must be kept for the small sunken patches which lie near the edge of the bank, on two of which was found as little as twelve and fourteen feet at low-water springs; but as they appear white, they will be easily seen from aloft, in contrast with the adjacent deep water.

"The seaman must not be here alarmed by the cross and troubled sea, which just upon the edge of the bank of soundings is produced by a strong easterly wind acting against the ebb stream. The strength of the ebb stream in the vicinity of the Great Barrier Reefs is, however, generally much less than the flood stream, which combines with the additional set to the northward, along the edge of the barrier, this set being caused by a long-continued S. E. trade-wind; and for this full allowance must be made, not only when trying to make Raine Island Entrances, but when passing through them, in order to prevent being swept to the northward among coral patches that have not been examined.

"From the position indicated by the before-mentioned soundings of twenty-five to thirty fathoms, a run of sixteen miles will lead a vessel to the Middle Banks; but the course should be decided on with great care, as it would be highly dangerous to fall to the northward of them. The course to make good is S. W. by W.  $\frac{1}{4}$  W., which, with a strong ebb stream, may sometimes be adopted; but at all other times the northerly set must be kept in check by steering a point, or even a point and a half, further to the southward.

"If Raine Island Passage should have been entered late

in the afternoon, it would be prudent to anchor abreast and well to the southward of the Middle Banks, in twelve or fifteen fathoms, by which the eastern sun of the following morning would enable the masthead man to clearly discover all the dangers lying in the track to the westward; to be prepared for which a prudent seaman will have his vessel under moderate but commanding sail, with an anchor ready to drop, at a moment's notice, the whole way from the outer barrier to the main land.

“Although, as before noticed, there is a passage to the northward of the Middle Banks, the patches which lie two or three miles to the northward, and Tynemouth Bank to the westward of them, render it unadvisable for a vessel to pass that way; if, therefore, the voyage be lengthened a few miles, it will be far better to make sure of passing to the southward of the Middle Banks, thereby escaping all danger, and having the advantage of seeing Ashmore Banks, which are always visible in clear weather at a distance of three or four miles, and Sir Charles Hardy Isles, at a distance of about fourteen miles.

“When the vessel has run the given sixteen miles from the entrance of Blackwood Channel, and is abreast of the Middle Banks, it becomes a matter of great importance to make out her position with respect to these banks, which, if not seen, may be done by bearings of Ashmore Banks and Sir Charles Hardy Isles; for a course must now be chosen for the North Channel, Pollard Channel, or Sir Charles Hardy Isles.

“Should Raine Island have been passed early in the morning, and the Middle Banks reached by noon, the North Channel will afford the shortest run to the Bird Isles, under the lee of which she may anchor if necessary.

North Channel.

“North Channel, which runs between the eastern pitch and northwest extreme of Cockburn Reef, and the scattered sunken patches to the northward, is somewhat shorter and more frequented than Pollard Channel.

“A vessel proceeding through the North Channel from the eastward, should pass at about three-quarters of a mile to the northward of the easternmost pitch of Cockburn Reef, steering W.  $\frac{1}{2}$  S., with Cockburn Isles on the port bow. When Sir Charles Hardy Isles are in line, S. E.  $\frac{3}{4}$  S., steer W. by N.  $\frac{1}{4}$  N., and round the spit of the northwest extreme of Cockburn Reef—which is clearly defined by the color of the water—at the distance of a quarter of a mile, then haul up more to the southwestward for about two or

Directions

three miles, to avoid the rock awash, described as lying two and a half miles to the westward of the pitch of the reef; the dangers of this channel being then passed, and the Bird Isles in sight to the westward, steer for them, and proceed as heretofore directed.

"It will not be necessary to follow to the letter these directions for the North Channel, as there is room enough for the navigator to proceed according to his own discretion when looking at the chart, taking especial care to keep a good lookout for the northern patches, and the dangers off the northwest extreme of Cockburn Reef.

Pollard Channel.

"Pollard Channel is a safe, though narrow passage, running nine miles, nearly northeast and southwest between the southeast edge of Cockburn Reef and the long bank of foul ground to the northwestward of Sir Charles Hardy Isles; the average breadth of the channel is about a mile, and the depth varies from sixteen to thirty fathoms, with sand and coral bottom. At springs, the streams run through with great velocity, and when opposed to strong breezes, create so confused a sea as would at times place a vessel in difficulties.

Directions.

"In sailing through Pollard Channel from the eastward, the southern edge of Cockburn Reef, being, as before observed, quite steep close to, should be skirted at a not greater distance than one third of a mile, to avoid a series of sandy shoals on the southern side, which, if the weather be fine, will be plainly indicated by the difference in the color of the water; these shoals contract the western end, and narrowest part of the channel, to three quarters of a mile in breadth.

"When the northwestern Sir Charles Hardy Isle bears E. by N.  $\frac{1}{4}$  N., well open of the southeastern island, and the largest Cockburn Isle N. N. W., the dangers of Pollard Channel, in running to the westward, will be cleared; and taking care to avoid the shoal patch to the southward of Cockburn Reef, already mentioned, a N. W. by W.  $\frac{1}{2}$  W. course, for sixteen miles, will take a vessel to the Bird Isles, when she may proceed as before directed.

"Vessels, after entering the Great Barrier Reefs by Stead Passage, or either of the openings between it and the parallel of  $12^{\circ} 30' S.$ , are recommended to steer for Ashmore Banks, and then proceed for North Channel or Pollard Channel, according to circumstances. It may perhaps be

found convenient to proceed from these banks by the open channel to the southward of Sir Charles Hardy Isles; but as that channel has not been closely sounded, it must be adopted with caution.

"Although Raine Island Entrance is to be preferred on account of the beacon and the greater breadth of the opening, it by no means follows that Stead Passage and the other practicable channels between it and latitude  $12^{\circ} 30'$  S. are to be condemned; on the contrary, in the event of a vessel making the Great Barrier Reefs, and either of these openings is distinctly recognized, it will be far better to take advantage of it than to attempt to beat out again for the sake of running through Raine Island Entrance, more especially if the vessel happens to find herself near an opening in Wreck Bay, or any other deep indentation of the barrier, out of which it is next to impossible for a sailing vessel to beat against the heavy sea which generally rolls in upon the reefs.

"These channels being similar in breadth and character, directions for one will do for all; and although they do not generally average more than a third of a mile in breadth, the Great Barrier Reefs are here so narrow, that the run from the heavy sea outside to the smooth water within the reefs, is, with a commanding breeze, accomplished in a few minutes.\*

Openings between lat.  $12^{\circ} 30'$  S. and Raine Island.

"When either of these openings is recognized beyond a doubt, steer boldly for it, conning the vessel from the mast-head, from whence, if the sun's glare be not ahead, all dangers lying in the channel will be easily distinguished by the color of the water. The vessel having fairly entered, may first steer for Ashmore Banks, and then proceed for North Channel, or Pollard Channel; or, if late in the day, anchor inside the reefs.

"Sir Charles Hardy Isles, two in number, are fringed with narrow coral reefs, which are steep-to; the southeastern island is two and a quarter miles in circumference, and of moderate height. The northwestern isle is not quite so large as the other, but it is higher and more peaked, its summit, nearly E. N. E. thirteen miles from Cape Grenville, being three hundred and twenty feet in height; a shoal spit runs out half a mile from its northwest side. Both isles are covered with coarse grass and stunted bushes,

Sir Charles Hardy Isles.

\* See Admiralty Charts of Australia.



growing on a stony soil, which, when seen from seaward, have a reddish appearance, and being distinctly visible from the Great Barrier Reefs, are good marks to steer for when running for the inner route. There is a deep channel a quarter of a mile wide between the islands.

Water.

"The southeastern Sir Charles Hardy Isle has the advantage of possessing a very fair spring of fresh water, close to the shore on the southwest extreme of the island, at two-thirds of a mile off which is a small rocky islet. The supply from March to July would be quite sufficient for a large ship; but afterwards the spring appeared to dry up, in which case it would be better to proceed to Cape York for water, where it can be procured at all seasons of the year.

"The best anchorage is near the northwest side of the southeastern isle; but a vessel may anchor in six and seven fathoms, almost anywhere under the lee of Sir Charles Hardy Isles.

Tides.

"It is high water, full and change, at Sir Charles Hardy Isles, at 9h. 15m.; springs rise ten feet.\*

Pandora  
Entrance.

Eu-

"This opening is only recommended as a sort of refuge entrance for a vessel to run for, in the event of her having overrun Raine Island Entrance, and being unable to beat back in time to enter that opening before dark.

"Pandora Entrance may be easily known by the large sand-bank on its southern side; round this, at the distance of about half a mile, and then steer S. W. by S., running through the passage with the sand-bank bearing northeast; the depth will then be from thirty to thirteen fathoms, when a vessel may anchor under the lee of the reefs; or if not late in the day, proceed to the northwestward.

"If, through thick weather or other unfavorable circumstances, a vessel should be so much out in her reckoning as to miss Pandora Entrance also, the Papuan or Great Northeast Channel is the only opening to leeward recommended, although a vessel may pass through Olinda, or Yule Entrance, if hard pressed, or even through one of the gaps farther to the northward. In running to the northward for the Great Northeast Channel, steer nearly parallel with the Great Barrier Reefs, and at such distance from them as circumstances may render necessary. As this route is little known, much is left to the discretion and vigilance of the navigator, especially when passing between the barrier and

\* See Admiralty Charts of Australia.

the outer chain of reefs which lie to the southeastward of Murray Island, and contract the channel to about twenty miles in breadth. Having passed these reefs and reached the parallel of  $9^{\circ} 15' S.$ , bear up to the westward for Bligh Entrance, and proceed as before directed.\*

"If the direct approach to this channel from the frequented part of the outer route were better known, it would be difficult to decide upon which to recommend—this, or Raine Island Entrance. At present the chart only shows the two tracks of Captain Flinders; but several merchant vessels are also known to have entered Torres Strait by the Eastern Fields and the Great Northeast Channel, without any reefs having been reported to exist between the outer route abreast of Alert Reef and the Eastern Fields.\*

Papuan, or  
Great Northeast  
Channel.

"The advantages of the Great Northeast Channel have already been alluded to, and, although the route round the Eastern Fields and through Bligh Entrance to Booby Island exceeds by about fifty miles that through the Raine Island Entrance, the difference in distance is more than compensated for by the saving of time and relief from anxiety; for the Great Northeast Channel being broad and easy to make, with regular soundings and few hidden dangers, a vessel, properly managed, may run through Torres Strait, from Bligh Entrance to Booby Island, without being compelled to anchor more than once; but entering the Great Barrier Reefs by Raine Island is necessarily attended with much more risk and anxiety; and the intricate nature of a great portion of the route through Torres Strait would render it necessary to anchor at least twice between the Great Barrier Reefs and Booby Island.

"A vessel by the outer route intending to proceed through Torres Strait by the Great Northeast Channel, having arrived at a position in about latitude  $15^{\circ} S.$ , longitude  $151^{\circ} 30' E.$ , may shape a course for the Eastern Fields by either of the tracks of Captain Flinders, carrying no more sail in the night than the vessel will conveniently bear when suddenly hauled to the wind, and taking every other precaution against unknown dangers which in this little known region may still exist. The northeastern extremes of the Eastern Fields and Portlock Reefs being well determined, those reefs should be passed on that side. From the northeast extremity of Portlock Reef, steer W. by N. fifty miles, which will

---

\* See Admiralty Charts of Australia.

lead the vessel abreast of Bligh Entrance, on the parallel of about  $9^{\circ} 15'$  S., from whence proceed as before directed.

Caution.

"It is hardly necessary to repeat that a vigilant lookout from the masthead in the daytime is absolutely necessary; at night, if the weather be not very boisterous, the ear may often detect the sound of breakers before they become visible. An anchor should always be kept ready to let go, and a vessel having entered the Great Barrier Reefs should be kept under easy, but commanding sail, with a boat in readiness to sound ahead on the appearance of discolored water, which will often be found to arise from the shadow of passing clouds, tide rippings in the vicinity of reefs, or from some cause not yet understood, in the spots of discolored water which have been so frequently met with and sounded over, without indicating any difference in the depth of water from that surrounding them.

Sounding.

"Although the lead should be constantly kept going while in soundings, it must not always be depended upon as indicating approach to reefs, as they generally spring up precipitously from the bottom, the lead often not giving sufficient warning to avoid them.

Glare of the sun.

"Steering directly with the sun in the vessel's course must be particularly avoided in the vicinity of reefs, as, from the strong glare, it is then scarcely possible to discover dangers in time to steer clear of them.

"It must be recollected that there are few familiar objects on the vast extent of the Great Barrier Reefs to point out the position of a vessel, and however minutely the outline and geographical details of the reefs and shoals in these seas may be given to the navigator, they will avail him but little, unless vigilance and due caution be observed; for charts of coral waters, even on the highest authority, must not lull him into a fancied security, as until every foot of ground has been thoroughly examined, it would be wrong to suppose that numerous shoals and small heads of coral do not exist, which have hitherto escaped detection."\*

Track of the *Astrolabe* and *Zélée* through Torres Strait.

To complete what we have to say concerning the routes through Torres Strait, it remains for us to speak of that of the corvettes *Astrolabe* and *Zélée*, under the orders of Ad-

---

\* These directions for the outer route are taken from the *Australia Directory*, published, under the authority of the Lords Commissioners of the Admiralty, by the Hydrographic Office, 1859.

miral Dumont d'Urville. We do not, however, advise its being taken; for Bligh Channel, and next Prince of Wales Channel, are far preferable in all respects.

The track pursued by the two corvettes carried them to the entrance of Bligh Channel; it passes north of Anchor Cay,\* then between the reef extending northeast of Arroub (Darnley) Island, and the detached reefs of which we have made mention. From Darnley Island it passes north of Atagor (Nepean) Island, to the northward of and near Hougat (Stephens) Island, then north of Dalrymple, (one of the Sister Islands;) that is, as far as this island the track keeps on the northern part of Bligh Channel. From Dalrymple Island the track passes west of Rennel Island, then, running along the southern margin of the Great Warrior Reef, it crosses the reef east of Toud (Warrior) Island by Mauvais Channel, which is excessively narrow. The broad passage here between Warrior Island and Djeguei (Dungeness) Island is, in all cases, very much preferable to Mauvais Channel, which perfectly merits its name. At the outlet of this channel the track leads directly north of Gueborar (Brothers) Island, and south of the small Nicholl's Cay, which is north of the Brothers at the distance of about four and one-third miles. From the Brothers, which presents two high hills, it takes a course nearly S. W. by W.  $\frac{1}{2}$  W. toward the north shore of Mulgrave Island, leaving to the north Orman Reef, (which this navigator attempted unsuccessfully to pass through in 1816,) Passage Island, Jervis Island, and several islets bordered with reefs marking the north shore of the channel, and of which the most westerly is Farewell Island; leaving to the south Matron Cays, Possession Island, Black Rock, and the reefs that border the north shore of Mulgrave Island. After having doubled this and Farewell Island, the ship is clear of the strait and enters the Indian Ocean.

We will now cite the opinion expressed by Captain Bannatyne on the outer route followed by him from Sydney to India, crossing Torres Strait by Bligh Channel.

Left Sydney the 1st of July; the 6th, passed between

---

\* See Chart No. 1091 of French Hydrography, surveyed and drawn by Messrs. Vincendon-Dumoulin, Hydrographic Engineer, and Midshipman Coupevent-Desbois. Many names differ on this chart from those on the English Charts 1077 and 1792. We will give those named on the latter in parentheses.

Wreck and Kenn Reefs; 12th, toward midnight, the ship was between Eastern Fields and New Guinea. At 10 a. m. made the breakers on Portlock Reef; at 4 p. m. doubled the northeast point of Portlock Reef, and toward 10 o'clock bore up for the entrance of Bligh Channel. The soundings at 4 a. m. were forty-nine and three-quarters fathoms, sand and coral; at 8 o'clock, forty fathoms, black sand. At 8.30, saw Bramble Cay at the distance of seven or eight miles, bearing northwest. At noon, Stephens Island bore south three miles off, and at 4 p. m. anchored in fifteen and a quarter fathoms, sand and mud, under Rennel Island, a cable's length from shore. The next day, at 7 a. m., made sail; at 8 o'clock, off Arden Island; at 10 o'clock, passed to the northward of Village and Cocoanut Islands, and to the southward of the Sisters Bet, Sue, and Poll. At 4 in the morning passed between Double and Wednesday Islands; at 6.30 the west point of Goode Island bore south one mile distant.

Thus, by this route, the passage of the strait was accomplished in thirty-four hours, of which fifteen were passed at anchor under Rennel Island; and thirteen days only from Sydney.

This channel, says Captain Bannatyne, one of the best I have seen, seems to me destined to become the one course for vessels from India to the east coast of Australia and back, especially for steamers. The New Guinea or Bligh Channel is, according to Captain Bannatyne, the best that can be taken, whether from the Indian or the Pacific Ocean, and that either with the N. W. or S. E. monsoon. We have shown how opinions differ with regard to the routes to be pursued in these parts, and we will leave it to captains to make their selection.

We give below the comparative advantages of each of these routes,\* according to Robson, who has long studied this question.

"The advantages of the inner passage are: it has been fully and ably surveyed; it is well delineated in excellent charts; sailing directions for its whole length are published; entrance to this passage is effected without difficulty or intricacy round Break-sea Spit; that extremity of the strait, under favorable circumstances, may be sailed for a considerable distance during the night, and anchorage is attain-

---

\* *Nautical Magazine*, 1837, p. 68.

able at any spot where it may be requisite to bring up. Against these, it is common to balance the disadvantages of such protracted straits navigation, the increased distance of full seven hundred miles,\* through which a ship is kept entangled among the reefs, while by the other route she would be sailing on an open sea; the labor of so frequently anchoring, and the loss of time.

"The advantages of the passage by the Barrier are said to be the shortness of the route and the consequent saving of time, an open sea as far as  $12^{\circ}$  south, the accuracy with which the openings in the reef are now known, and the shortness of the distance thence to Bird Islands, where the two routes unite, so that a ship may pass the straits with only twice anchoring, or at most four times.† All these points may be admitted as true."

We now come to consider the Great Barrier itself. Commencing at the south, and running toward the north, we find the first and second Three-mile Pass, that which, in 1780, Bligh's boat entered, the one where the *Hibernia* passed in 1810, the one where Captain James Cook entered in 1770; further north still are Nimrod, Brown, Winter,‡ Stead, and Grove Passages, and some others without names, believed to be also safe. These passes are tolerably well known; finally, north of Raine Island, there are Yule, Fly, Cumberland, and Flinder's Passages, the two last situated near the Murray Islands.

"Now, from the above statement it would seem that the advantages lie greatly on the side of the outer passage, but notwithstanding all that appears so favorable, I must still consider the inner route the best, and this in regard of one circumstance of paramount importance, namely, the weather. It appears that throughout the period of the easterly monsoon the weather is unsettled, and fine clear weather with a steady monsoon breeze is interrupted by dark squally days with thick weather and rain. Approaching the Barrier under such circumstances would be peculiarly hazardous; for, as there is no anchorage nor shelter to windward of it,

\* G. W. Earle says the opposite, and shows that the inner route is shorter by two hundred miles than the outer route.

† It will be perceived that Robson does not speak of Bligh Entrance.

‡ Winter Pass, discovered in 1831, by Captain Richardson, is situated nearly in  $11^{\circ} 58'$  south latitude, and in  $143^{\circ} 47' 36''$  east longitude. This pass is safe, deep, and about three-quarters of a mile wide. *Nautical Magazine*, vol. i, p. 116.

nothing but an open, unbounded ocean, a ship so caught, and obliged to carry, off a danger of such magnitude against a heavy sea and lee current, would be in imminent peril; and although a commander may have gone by that route many times, and may have invariably experienced fine weather, no man knows what is before him; and what others have found to be the case, he also may, to his cost."

Robson mentions here, in support of this opinion, several examples which we need not repeat. He then compares the length of passage by the outer route with that by the inner route, of which he says the length and fatigue have been exaggerated. Thus the *Flora* took twenty-two days to go from Sydney to Torres Strait by the outer route, the *Bentinck* twenty-eight days, the brig *Joseph Winter* twenty-two days. By the inner route, a convoy of eight ships, convoyed by the steamer *Crocodile*, sailing from Port Jackson, arrived at Booby Island in twenty-three days; the brig *Helen* and the *George Hibbert*, sailing together from Sydney, and forced to anchor several times, reached Booby Island in twenty-nine days, of which eleven days were passed at anchor on account of a very unusual period of bad weather. Finally, Robson, whose discussion we abridge considerably, concludes by some directions relating to Stead's Passage which we give here, as they might in certain cases be useful.

Stead's Passage.

"In some directions which have been published for the Barrier, particularly Stead's Passage, it is recommended for a ship to make the detached reef latitude  $12^{\circ} 0' S.$ , and to run along its *northern* side as she advances toward the Barrier. With all deference to the sentiments of a clever practical navigator, who gives this advice, it nevertheless seems to be very questionable, the prevailing winds being from the southward of east, varying from about E. S. E. to S. S. E. Stead's Passage will be found situated toward the leeward angle or bend of that deep indentation which is formed in the Barrier between the latitudes of about  $11^{\circ} 51'$  and  $12^{\circ} 7'$ ; consequently, if, with the wind at S. E., a ship passes along the *northern* side of the detached reef, and stands on from thence for Stead's Passage, she runs into a leeward bight; she has but one more known passage—*i. e.*, Grove's—to leeward of her, and should the wind veer more southerly, she might find some difficulty in passing Stead's

Passage,\* which is tortuous, longer than some others, and has the objection of a shoal patch in the fairway, which, though believed to have plenty of water over it, is nevertheless a valid objection, while the actual depth of water remains uncertain.

“But if, on the contrary, a ship having made the detached reef passes to the *southward* of it, she will then approach the Great Barrier to windward; and in proportion as the wind is southerly, she will get into perfectly smooth water under the lee of that bend of the reef, *i. e.*, the main Barrier, which runs to the eastward in about  $12^{\circ} 7'$  or  $12^{\circ} 8'$ . Hence, being on the weather side of this indentation, she will have the advantage of choosing her opening. She will see, as she approaches, the Nimrod's entrance nearly right ahead, and, supposing she does not take this, then bearing along the face of the Barrier, she will have each of those known and approved passages which are given in the chart, opening in succession as she advances, or runs to leeward, and may adopt that which she can most conveniently sail through, or may otherwise be induced to adopt.”

This opinion, Robson adds, is not only mine, it is also that of Captain T. Johnson, of the *Recovery*.

We give, also, concerning the outer route, the opinion of Captain Mackenzie, who has been a long time in this vicinity, and from whom we have already borrowed several directions in the *Considérations Générales*, &c. The *Gambia* made the passage from Sydney to Booby Island in twelve days, taking the outer route and Bligh Passage. We will not repeat this route, previously given and described in detail in the *Nautical Magazine* of 1852, page 556. We will only quote some of the observations made by Captain Mackenzie.

“The Prince of Wales Channel seems at all times preferable to Endeavor Strait, it being well buoyed, marked, clear of sunken rocks, and with moderate depths to anchor in at any time or spot, whilst the four sunken rocks discovered in Endeavor Strait, as well as the one found between Entrance and Little Woody Islands† since the last careful examination by her Majesty's ship *Rattlesnake*, renders it any-

---

\* This objection appears to us unfounded, for there is a broad passage between the large detached reef situated north of Raine Island and the Great Barrier, and, besides, the ship will have to leeward the Raine Island Passages, which appear to us, in all cases, much preferable to Stead's Passage, lying across the Ashmore Banks.

† These dangers are laid down on the corrected chart of Blackwood, No. 1748.



thing but a safe navigation, and it should not be during the night.

"The only risk I can perceive in the adoption of the passage we have made by Bligh Entrance may be from natives, and all the sound arguments advanced by Captain King are in favor of the outer route as well. The Eastern Fields, coast of New Guinea, with Portlock and other reefs, prevent any sea from getting up, as prevails outside the barrier. \* \* \*

In our case we had soundings to guide us, and no risk or cause for anxiety. The distance through the strait from east to west (East Key to Booby Island) is less entering than any other route. The sun never shines ahead to dazzle the eyes; no higher course than S. S. W. is required; and even should the wind become scant, there is not only ample room to work, but in the event of very thick and squally weather occurring, plenty of anchorages at any time in moderate depths. Once N. N. E. of Darnley Island, there is no risk in keeping under sail in a clear night, or at any rate in a moonlight night, as far as Wednesday Island. \* \* \*

One would suppose, after reading Captain Blackwood's account of this passage in the *Nautical Magazine*, and a sight of his chart, that it would at once, during the easterly monsoon, supersede every other route for merchant ships, were it not that constantly each season we see the effect of old prejudices, which lead parties (risking, we conceive, thereby their insurance) to prefer Stead's and other passages to that of Raine Island, *after* the erection of the beacon, and the publication of the charts and directions, from which period no one could be justified in adopting any other than Captain King's inner route for it.\* In the westerly monsoon, by the *Rattlesnake's* late surveys, vessels would be enabled to take this passage and run down their easting to a position enabling them to enter and cross the southeast trade to advantage."

To resume: for the inner route we have the very influential opinion of Captain King, that of Robson, and even that of Captain Blackwood, who looks upon this route as the safest; for the outer route, we have indisputable facts, opposed to those cited by Robson; this route is evidently

---

\* That is, the route by the Prince of Wales Channel as far as Cape York; then the one that we have described from King, from Cape York to Bird Islands; and that which we have given from Blackwood, from Bird Islands to Raine Island, taking these several routes in the inverse direction.

the shortest, as Captain Blackwood tells us. We have thought proper to point out to seamen these differences of opinion with regard to the advantages and disadvantages of the two routes; without entirely settling the question, they tend to throw light on it, and consequently will assist them in making a selection. If we were obliged to state our own opinion, we should say that it was best to take the inner route when not pushed for time; the outer route in the opposite case. It is probable that this last will be the route most generally chosen by merchantmen, to whom a quick passage is a prime consideration. In this case we should take Bligh Channel, and then Prince of Wales Channel, or *vice versa*, according as we came from the east or the west.\*

The best route that can be taken to India or China, sailing from Port Jackson, not wishing to take the southern route through Bass Strait or the northern through Torres Strait, appears to be the one passing eastward of New Guinea through Pitt Passage, and crossing Java Sea from east to west, or leaving it by taking Ombay Strait. In this latter case, after having left Java Sea, the course is south of the Sunda Islands.

Route from  
Port Jackson to  
India, through  
Pitt Passage.  
From March to  
September.

This route, as well as the northern one, must only be pursued from March to September; that is to say, when the southeast monsoon prevails south of the Equator.

Sailing from Port Jackson or Van Diemen Land, run east, a little north, up to the meridian of 160° east longitude; then steer north, keeping nearly on this meridian, and passing east of Howe Island, Middleton Island, Wreck Reef, and Cato Bank.

Captain Bristow, however, thinks that it is preferable, sailing from Port Jackson, to follow the coast as far as Sandy Cape, and to pass west of the reefs we have just named.

In this way the ship passes west of New Caledonia, keeping a good lookout for the dangers in this vicinity, and runs for Cape Saint George, the southern point of New Ireland.

When making for Saint George's Channel and Pitt Passage, it is necessary to keep at no great distance from the coast of New Guinea, mistrusting the easterly currents and light N. W. breezes, frequently met with north of the

---

\* The more recent surveys in these localities will be found on the British Admiralty Charts Nos. 2763 and 2764.

Equator, which sometimes drive vessels very far out to sea; the vessel should, therefore, on reaching the meridian of  $134^{\circ}$ , keep near the coast of New Guinea when approaching Pitt Passage with the S. E. monsoon, (from March to September.)

Instead of taking Saint George's Channel, the vessel may enter the one contained between New Britain and King William's Cape, leaving Rook Island on the east or west; she will then steer to pass between Lottin Island and Long Island, or double the latter to the west, according to circumstances. She will then coast the shore of New Guinea, passing north of the neighboring islands, from the Gulf of the Astrolabe as far as the island of Dumont d'Urville, and follow the coast as far as the point of the same name; from this point she will shape her course to pass north of Traitor's, Mysory, and Providence Islands, then follow the coast of New Guinea to Cape Mamori, and, keeping near shore as far as Cape Good Hope, she will reach Pitt Passage by Dampier's Strait. This route, followed by the *Astrolabe*, is shorter and more direct than that through Saint George's Channel, and is not so dangerous.

On reaching Pitt Passage by Dampier's Strait, or by whichever appears the most suitable, adhere to the different directions we have given for sailing in the Indian Ocean on the return from China through Pitt Passage, passing east of the Philippine Islands.

Same route  
from Port Jack-  
son to India,  
through Pitt Pas-  
sage.  
From Septem-  
ber to March.

When the N. W. monsoon prevails south of the Equator, a vessel bound to India must not, as in the route above described, coast along the shores of New Guinea. In November, December, and January, it is better to run north as far as the parallel of  $5^{\circ}$  N. latitude, near which the N. E. trade-winds will be met with. At this time of year pass south of Mindanao, through Bassilan Strait, cross Sooloo Sea, then enter China Sea through the Straits of Balabac, rounding the northern point of the Islands of Banguey and Balambangan. Thence, crossing China Sea, make for the Straits of Malacca. This route is, undoubtedly, the best that can be taken bound to India during the N. E. monsoon, sailing from the ports of the east coast of Australia or Van Diemen Land.

Eastern routes  
to China from the  
ports of the east  
coast of New Hol-  
land.  
N. W. Monsoon.

A vessel leaving the ports of the east coast of New Holland or of Van Diemen Land, bound to China or India, during the time when the N. W. monsoon prevails south of

the line, (from September to March,) and not wishing to take the southern route through Bass Strait, will meet with strong breezes by taking the eastern route; that is, a route still more easterly than the last mentioned. There are, in this case, two routes pretty generally used: one passes west of New Caledonia, New Hebrides, and Santa Cruz Islands, and east of the Solomon Archipelago; the other passes east of New Caledonia, New Hebrides, and Santa Cruz Islands. These two routes coincide nearly with what we have described as the great eastern track, from the Cape of Good Hope to China.

To follow the first of these routes, on leaving Port Jackson stand E. N. E. to take advantage of the regular breezes found at sea, and, on reaching the meridian of  $160^{\circ}$  E. longitude, pass to the eastward of Howe and Middleton Islands, running north; as there are often S. W. winds near New Caledonia, it must not be approached too closely. After having doubled this island, which must be passed to the westward, run north on the meridian of  $164^{\circ} 20'$  for the channel lying between the Santa Cruz Islands and the Archipelago of the Solomon Islands.

This archipelago being rounded, if, in the first months of the monsoon, the vessel is bound to China, she will cross the Archipelago of the Caroline Islands, running north; when clear of this archipelago, she will steer to run near the point of Guam Island, where she will take one of the channels between the Ladrone Islands; she will then stand on next through the Passage or Strait of Formosa, then between the Bashee Islands.

In case of not arriving at the Solomon Islands till after the month of January, the period at which the winds of the N. E. monsoon slacken in the China Sea, the ship could pass between the Islands of Gouap and Goulou, or between this latter and the Pelew Islands; thence, she should steer to round the northeast point of Luzon, then take the most convenient channel for crossing the Straits of Formosa and reaching China.

The second eastern route from the ports of the east coast of Australia or Van Diemen's Land to China is longer than the preceding; but it has fewer dangers, and has also the advantage of more regular winds than those west of New Caledonia and New Hebrides; in keeping to windward of all these islands, it is only necessary to look out for the

westerly currents met with in crossing the belt of the S. E. trade-winds.

On leaving port, steer to sight Norfolk Island, or to pass a little to the eastward of it; thence, steer to make Matthew's Island (or volcano) visible twenty-four miles. Pass to the eastward of New Caledonia, New Hebrides, and the neighboring islands, and leave the Feejee Islands on the east; round the New Hebrides at a convenient distance, keeping on the meridians of  $171^{\circ}$  or  $172^{\circ}$ . If not able to weather Erronan Island, the most easterly of the latter, pass into the channel that separates it from Tanna; then stand north as far as the parallel of  $13^{\circ}$  S. latitude. If the New Hebrides have not been seen, endeavor to sight Tucopia or Fataka Island; then continue to run north so as to cross the line between  $160^{\circ}$  and  $168^{\circ}$  E. longitude. As the westerly currents are in general strong, endeavor to reach the Carolines on the meridian of  $163^{\circ}$ , and, in case the line has been crossed in  $160^{\circ}$  or  $162^{\circ}$  E. longitude, endeavor to pass through this archipelago between the meridians of  $156^{\circ}$  and  $155^{\circ}$ . When clear of the Carolines, pass south of the Ladrões or through one of the channels between these islands; then shape the course for the Straits of Formosa to enter the China Sea.

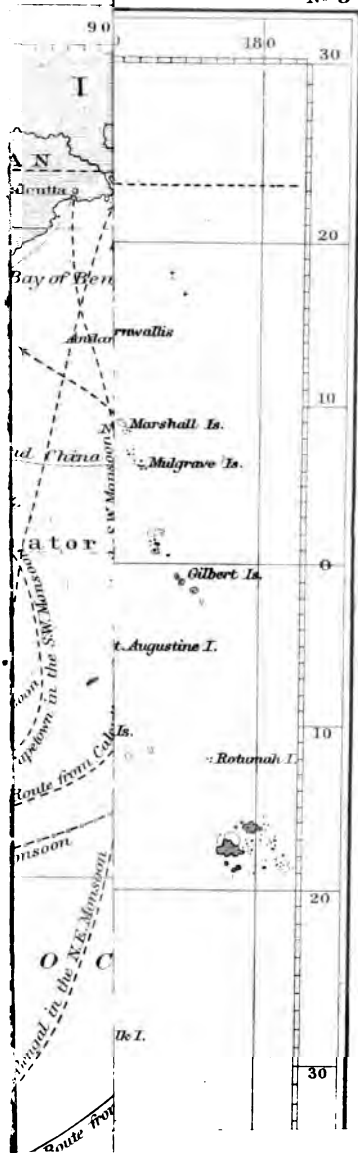
In the routes that we have just described, if any delays occurring during the voyage should prevent arriving in the China Sea till after the end of the N. E. monsoon, the latter part of the route might be changed from north of the Equator. In that case pass south of the Mindanao to take Bassilar Strait; or passing through the Philippines, take the Strait of Panaon or Surigao; or still better, that of San Bernardino. The first is north of Mindanao; the second, north of Samar. The first leads into the Sooloo or Mindoro Sea; the second, into the China Sea, north of Mindoro. It would do equally well, passing south of this last island, to take Mindoro Strait. The Strait of San Bernardino is generally taken in preference to Surigao Strait for passing from the Pacific Ocean into the China Sea.

This navigation, though belonging more to the Pacific Ocean, is nevertheless a part of that of the Indian Ocean.

We will here terminate this memoir on the Indian Ocean, with the hope that this examination may be useful to navigators, and save them tedious research. We have attempted to present a resumé of the directions which are found scat-

UTE

Nº 3





tered through many volumes. The order adopted will always permit the information required to be easily found; and in most cases the route to be followed, according to circumstances, can be readily selected.

Without regarding these rules as absolute for the navigation of the Indian Ocean, it would be well to observe them as nearly as possible, as they are the fruit of long experience acquired by former navigators, and most generally they have taken to their destination with the least delay those who have followed them.







## APPENDIX.

### NAUTICAL DIRECTIONS TO AVOID HURRICANES.

From motives which it would be useless to mention, we had not intended to give in this work the nautical directions for endeavoring to escape the violence of hurricanes.

Having received many inquiries on the subject, and its omission in the *General Examination* having been commented on, thanks to the obliging kindness of M. Keller, we have been able to supply the deficiency. Not only has this learned hydrographic engineer authorized us to take from his memoir of 1847\* the nautical directions which he published at that time, but he has furnished us with an extract from a memoir much more extended on the same subject. This last memoir of M. Keller (of which we have heretofore made mention) is yet unpublished, and we cannot too warmly thank the author for the readiness with which, for the general benefit of navigators, he has been pleased to communicate to us that portion of it which is to them of the greatest importance.

DE KERHALLET.

*Stranger's Tribune, Edward*

EXTRACT FROM THE MEMOIR OF M. KELLER, PUBLISHED IN 1847.

We will recapitulate for each hemisphere the nautical directions for attempting to avoid the violence of hurricanes, and to facilitate their application by navigators threatened to be enveloped by these storms.

#### IN THE NORTHERN HEMISPHERE.

*Hurricane of West Indies, Cyclone of India, Typhoon of China Sea.*

"If the wind hauls by the compass to the right, or in accordance with the movement of the hands of a watch, you are in the dangerous semicircle of the tempest, and, whatever may be the latitude, you should heave-to on the starboard tack; or, if the force of the wind is not too great, stand on close-hauled on the starboard tack.

---

\* Hurricanes, Tornadoes, Typhoons, and Tempests, &c.

"If, on the contrary, the wind hauls by the compass, to the left, or in an opposite direction to the movement of the hands of a watch, you are in the manageable semicircle of the tempest; and, if the sea is not too heavy, you should run with the wind on the starboard quarter; or, if the sea is too heavy, heave-to on the port tack."

#### IN THE SOUTHERN HEMISPHERE.

##### *Hurricanes in the Channel of Mozambique, Island of Bourbon, &c.*

"If the wind haul by the compass to the left, or in a direction opposite to the movement of the hands of a watch, you are in the dangerous semicircle of the tempest, and, whatever be the latitude, you should heave-to on the port tack; or, if the storm is not too heavy, stand on close-hauled on the port tack.

"On the contrary, if the wind hauls by the compass to the right, or in accordance with the movement of the hands of a watch, you are in the manageable semicircle of the tempest; and, if the sea is not too heavy, run with the wind on the port quarter. If the sea becomes too heavy, heave-to on the starboard tack.

"We will add that after having experienced a hurricane in less than  $26^{\circ}$  S., or  $30^{\circ}$  N. latitude, you should not for some days steer toward the Pole, to avoid again encountering the branch of its path the furthest removed from the Equator; for although the velocity of its movement exceeds greatly that of a ship, yet the latter may describe the chord which joins two points of the curve of the hurricane, in the same time employed by the meteor to run over the arc of this chord.

"This precaution would be superfluous in the hurricanes of the Gulf of Bengal, and in the typhoons of the China seas, for these seas only extend to  $30^{\circ}$  N. latitude, and only contain a limited and sensibly rectilineal portion of the general path of hurricanes, which spend themselves on the land when directed toward the N. W.

"These practical directions are independent of the latitude; they apply to all the routes of typhoons, and assure escape in the right direction when this is possible."

EXTRACT FROM AN UNPUBLISHED MEMOIR OF M. KELLER,  
RELATING TO MANEUVER IN HURRICANES, CYCLONES, TY-  
PHOONS, AND TEMPESTS.

"The gyratory movements of hurricanes determine the tack.

"The movement of translation decides the course a ship should take.

"In the northern hemisphere the gyratory movement is opposite to the movement of the hands of a watch, and in the southern hemisphere it is in the same direction.

"The gyratory movement being invariable in each hemisphere, the tack upon which a ship should be placed is equally invariable. It is the starboard in the northern hemisphere and the port in the southern hemisphere.

"The movement of translation of the hurricane determines for both hemispheres.

"1. In the dangerous semicircle, the course close-hauled, as long as the barometer falls, and with the wind free when it rises.

"2. In the manageable semicircle, the course with the wind on the quarter as long as the barometer falls, and with the wind free when it rises.

"The dangerous semicircle being to the right of the path of the center in the northern hemisphere and to the left in the southern hemisphere, the course for escape, that is to say, the route which should be pursued to increase the distance from the center of the hurricane, will be known, if it is known on which side of the path of the center of the hurricane the ship is placed; now the side is indicated by the variation of the wind by the compass, produced by the change of place of the center of the storm.

"If in looking in the eye of the actual wind, the wind as it hauls blows from the right, the ship is to the right of the path of the center. If, on the contrary, the wind changes to the left, the ship occupies a position to the left of the path of the center; after this, the route to be pursued to increase the distance from the center, depends exclusively on the variation of the wind.

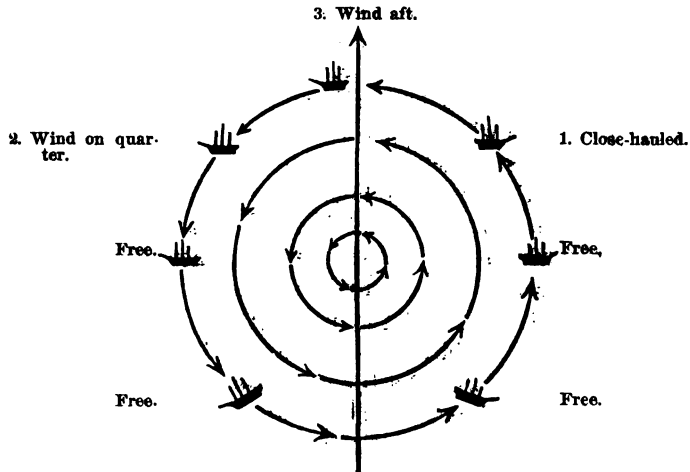
"This variation should be observed hove-to, in order that it be the result of the change of the base of the cyclone, and not the change of position of the ship; besides, it should correspond to a fall of the barometer, a distinctive mark of

the actual penetration of the ship into the body of the hurricane.

"The indications of the approach of a hurricane being a heavy swell, a steady fall of the barometer and an increasing violence of the wind, as soon as these are observed a ship should reduce sail and be hove-to, on the starboard tack in the northern hemisphere, and the port tack in the southern hemisphere, without taking into consideration the direction of the waves, in order to escape the center of the storm and be in a position to execute, at once, such ulterior maneuvers as the variation of the wind, observed while hove-to, may determine. A resumé of these maneuvers is given in the following:

**MANEUVER IN HURRICANES IN: THE NORTHERN HEMI-SPHERE.**

*Northern hemisphere, starboard tack.*



"Being hove-to on the starboard tack, barometer falling:

"1. If the wind haul by the compass to the right, or in the direction of the movement of the hands of a watch, the ship is to the right of the path of the center, in the dangerous semicircle, and should run close-hauled on the starboard tack and keep this course until the barometer rises and then run free.

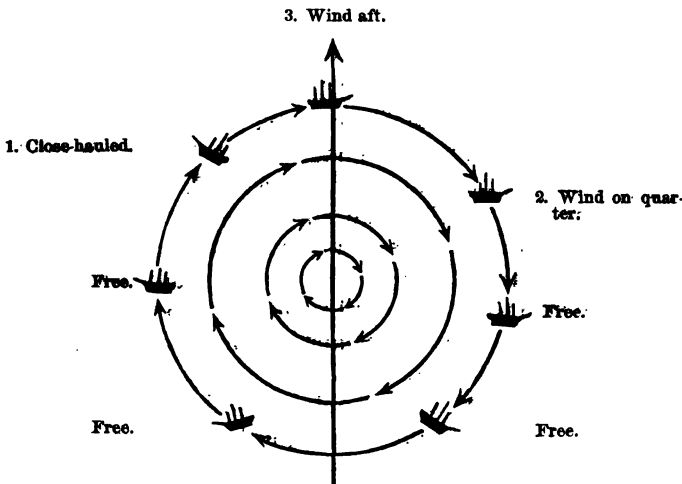
"2. If the wind hauls by the compass to the left, or contrary to the movement of the hands of a watch, the ship is

to the left of the path of the center, in the manageable semicircle of the cyclone, and should run with the wind on the starboard quarter, and maintain this compass course during the ulterior changes of the wind until the barometer rises; from this time shape a course free.

"3. If the wind as noted when hove-to does not change its direction during the progressive fall of the barometer, the ship is in the path of the center, and should run with the wind aft and keep the same compass course on the starboard tack until the barometer rises; from this moment a course free should be maintained to the end of the storm."

#### MANEUVER IN HURRICANES IN THE SOUTHERN HEMISPHERE.

*Southern hemisphere, port tack.*



"Being hove-to on the port tack, the barometer falling:

"1. If the wind hauls by the compass to the left, in a direction contrary to the movement of the hands of a watch, the ship is to the left of the path of the centre, in the dangerous semicircle; she should run close-hauled on the port tack and preserve this course until the barometer rises, and then shape a course with the wind free.

"2. If the wind hauls by the compass to the right in accordance with the movement of the hands of a watch, the ship is to the right of the path of the center, in the manageable semicircle of the storm, and should run with the wind on the port quarter and maintain this compass course during

the ulterior changes of the wind until the barometer rises; when shape a course free.

"3. If the wind, observed when hove-to, does not change its direction during the progressive fall of the barometer, the ship is in the path of the center and should run before the wind, and keep the same compass course on the port tack, until the barometer rises, a course with the wind free should be constantly maintained until the end of the storm.

"These directions relative to maneuvers in hurricanes in the two hemispheres differ from those of page 19 of our memoir on hurricanes, tornadoes, typhoons, and tempests, as the maneuvers advised by Reid, in his recent work, *The Progress of the Development of the Law of Storms*, page 27, differ from those recommended in the two editions of his first work, *The Law of Storms*, which has been extolled by Piddington, Thom, &c.

"The latter work advised heaving-to on the port tack in the manageable semicircle of hurricanes in the northern hemisphere, and on the starboard tack in the southern hemisphere, in order to avoid the danger of being taken aback in the shifts of wind. But this maneuver having the grave disadvantage of pushing the ship toward the center and precipitating her into a danger more certain and more formidable, Reid, struck by this disadvantage, advises at present to renounce this mode, and in all cases to take the starboard tack in the northern hemisphere and the port tack in the southern hemisphere.

"We are entirely of this opinion, which simplifies the maneuvers in reducing them to a question of direction and placing the tack out of the case, the more so as the course with the wind on the quarter and the wind aft being substituted in the recent directions for hove-to on the opposite tacks in the manageable semicircle of hurricanes, ships need not fear being taken aback, for the shifts of wind are never so great at the commencement of a hurricane as to pass from aft forward.

"On the other hand the variation of the wind arising from the ship penetrating the base of the hurricane is greater in a given time as the penetration is greater, or as the velocity of the translation of the hurricane is greater. Now, this velocity keeping back the wind from the manageable semicircle, the wind there is more feeble according to the

rapidity with which the hurricane advances in its path, thence, the greatest variation in the direction of the wind which could be feared would be only from a wind comparatively light and by no means formidable, and if, on the contrary, the wind is strong it varies but little, because the velocity of the translation is feeble, and then there is no danger of being taken aback; although in this case the violence of the wind in the manageable semicircle differs but little from that in the dangerous semicircle.

"We will add that the maneuver, wind aft, involves a great reduction of sail, to manage the ship almost under bare poles if the wind is very violent, in order to reduce the speed of the ship and the impetus which she communicates to the waves, which would be likely to comb over aft if the speed were too great. It is always better to run the risk of shipping a few seas than to remain stationary, on all courses, except that, with the wind aft, it is necessary to make sail, otherwise the ship would be at the mercy of the waves."

That navigators may judge of their maneuver by the state of the sea, we will show the direction of the predominant wave on the different courses prescribed.

DIRECTION OF THE PREDOMINANT WAVE ON THE DIFFERENT COURSES.

In the northern hemisphere, starboard tack.

The ship being hove-to on the starboard tack :

On the course pre- } the predomi- } on the starboard quar-  
scribed free, } nant wave is } ter.

In the dangerous semicircle :

On the constant course, } the wave is } on the starbord beam.  
close hauled,

In the manageable semicircle :

|                         |                 |                                |
|-------------------------|-----------------|--------------------------------|
| 1st. Wind aft.....      | } the wave is { | on the port quarter.           |
| 2d. Wind on quarter..   |                 | aft.                           |
| 3d. Wind free .....     |                 | on the starboard quar-         |
| 4th. Close-hauled ..... |                 | ter.<br>on the starboard beam. |

In the southern hemisphere, port tack.

The ship being hove-to, port tack :

On the course pre- } the predomi- } on the port quarter.  
scribed free, } nant wave is }



In the dangerous semicircle.

On the constant course, } the wave is { on the port beam.  
close-hauled,

In the manageable semicircle:

|                        |                 |                                           |
|------------------------|-----------------|-------------------------------------------|
| 1st. Wind aft.....     | } the wave is { | on the starboard quar-                    |
| 2d. Wind on quarter..  |                 | ter.                                      |
| 3d. Wind free .....    |                 | aft.                                      |
| 4th. Close-hauled..... |                 | on the port quarter.<br>on the port beam. |

"According to the foregoing, the most unfavorable direction of the wave is that of close-hauled in the dangerous semicircle, but on this route, the ship being supported by the wind, the rolling is not likely to affect the spars; the pitching will be moderate, and the helmsman must watch the waves and strive to avoid the shock of the heavy seas. This course should not be abandoned, for it is the only one by which to avoid future peril, as the skill of the helmsman may meet the present danger. The danger here mentioned should never make the mariner neglect the rules laid down. He should follow them at all hazards, whatever may be the state of the sea, for certainly his situation will become more dangerous the longer he delays to execute the maneuver which alone can secure his safety, by removing from the center of the hurricane."

The following is a resumé, for the two hemispheres, of the practical directions already given.

#### GENERAL REPRESENTATION OF THE MANEUVER IN HURRICANES, TYPHOONS, AND TEMPESTS.

As soon as a progressive fall of the barometer and increasing violence of the wind indicate the approach of a hurricane, all the necessary precautions should be taken; heave-to, so as to remain, as nearly as possible, stationary, or at least making very little progress, in order to observe the wind during the first depression of the barometer and to decide from it the course for escape, as follows:

In the northern hemisphere, starboard tack:

The starboard tack should be taken equally in heaving-to at first as for the course of escape.

If, when hove-to, the barometer falling, the wind has not changed its direction, run with the wind aft, and keep this original compass course.

|                                                                                                            |                                                                              |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
| If the wind hauls to the left,<br>run with wind on quarter,<br>and keep this original com-<br>pass course, | If the wind hauls to the right,<br>run close hauled and keep<br>this course, |
|------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|

until the barometer rises.

From this moment, and as long as the  
 wind is violent, follow the course free  
 on the starboard tack.

In the southern hemisphere, port tack :

The port tack should be taken equally in heaving-to at  
 first, as for the course of escape.

If, when hove-to, the barometer falling,  
 the wind has not changed its direction,  
 run with the wind aft, and keep this  
 original compass course.

|                                                                                      |                                                                                                                 |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| If the wind hauls to the left,<br>run close-hauled, and keep<br>this compass course, | If the wind hauls to the right,<br>run with wind on the quar-<br>ter, and keep this original<br>compass course, |
|--------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|

until the barometer rises.

From this moment and as long as the wind continues vio-  
 lent, follow the course free on the port tack.

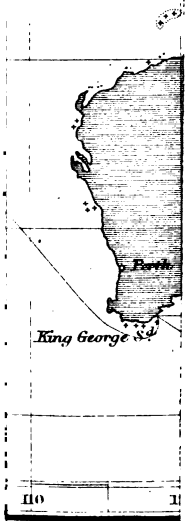
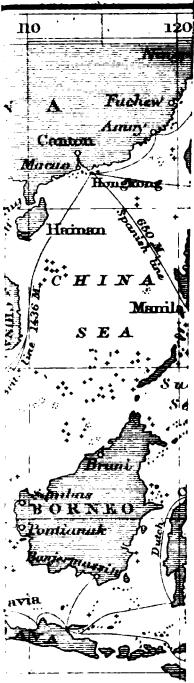
“These practical rules are general and independent of  
 all conjecture upon the direction, the velocity, or the radius  
 of the storm; they reduce the maneuver to a question of  
 courses, the tack being constant and invariable in each  
 hemisphere; they should be executed strictly, without any  
 thought of the direction of the wave, for being influenced  
 by the state of the sea might cause a false maneuver;  
 they are treated of at a greater length in the work which  
 will be hereafter published, to support them, and to confirm  
 and justify the confidence of seamen.

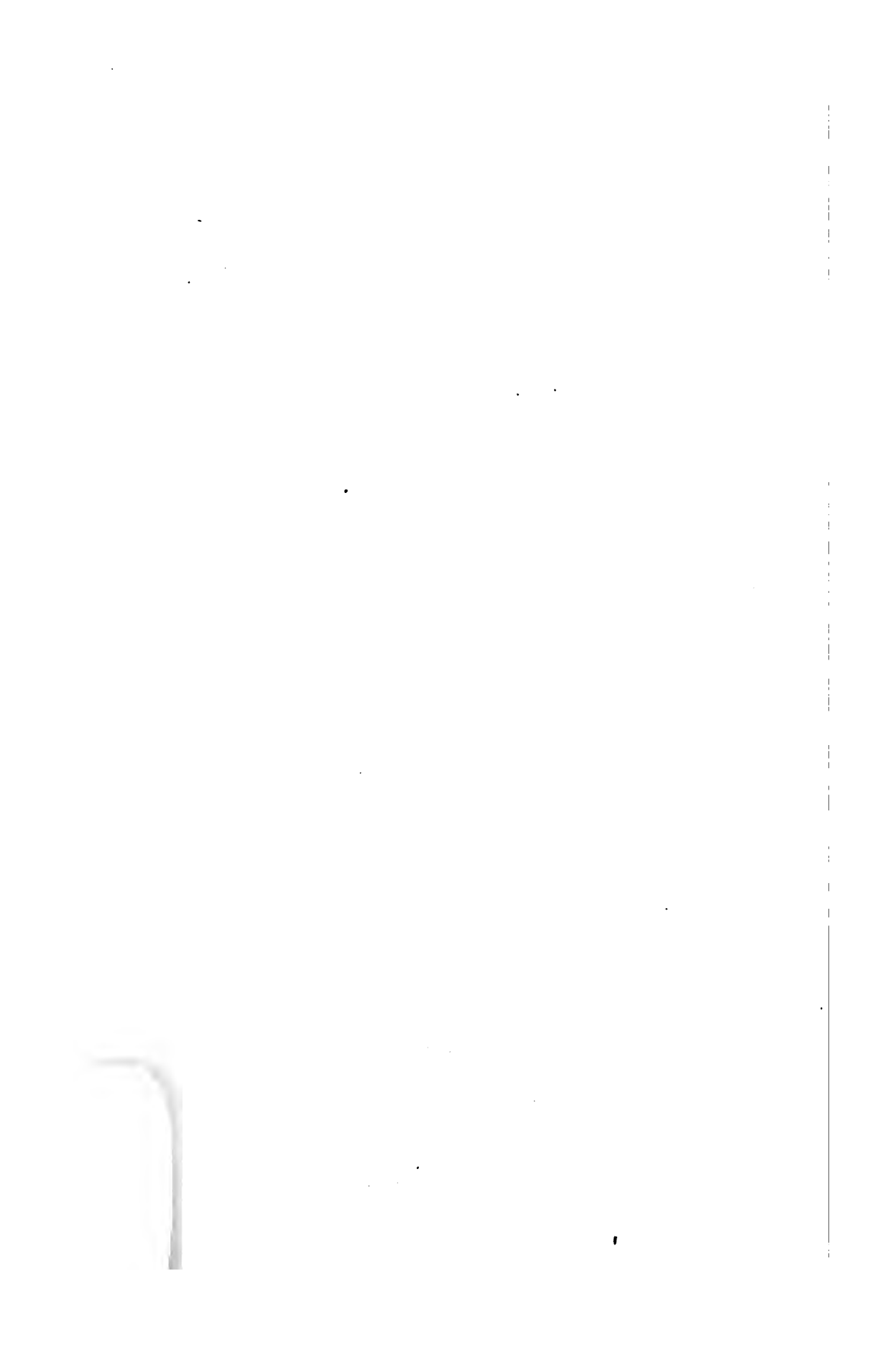
“In this work we will exhibit the great variety of direc-  
 tion in the paths of hurricanes observed in the same lati-  
 tudes, and often in the same localities, to demonstrate the  
 necessity of rules, independent of any particular direction  
 of the hurricane, and to prove to navigators how great the  
 danger would be were they to regulate their maneuvers by  
 rules founded on a single conjectured direction, indicated in

advance. On the other hand to confirm our own instructions we will give the list of numerous vessels which, from having executed maneuvers different from those we have laid down for each case, have become more involved in the storm and been seriously damaged.

“KELLER,  
“*Ancien Élève de l'École Polytechnique,*  
“*Ingénieur Hydrographe de la Marine.*”

# EAN





## ALPHABETICAL INDEX.

### A.

|                                                  | Page.                                                 |
|--------------------------------------------------|-------------------------------------------------------|
| Abyssinia, Coast of.....                         | 11, 108, 109                                          |
| Acheen, Cape .....                               | 26, 39, 85, 96, 98, 124, 125, 131, 135, 153, 165, 166 |
| Acheen Road.....                                 | 116, 117, 118, 121, 122, 127, 129, 131, 132           |
| —, Route from Pondichery or Madras to.....       | 131, 132                                              |
| Acoong-Chow Rock.....                            | 172                                                   |
| Aden, Cape .....                                 | 8, 107, 127                                           |
| —, Gulf.....                                     | 11, 75, 106, 110                                      |
| —, Port.....                                     | 11, 76, 106                                           |
| —, Winds in Gulf of .....                        | 8, 9                                                  |
| Adolphus, Isle of Mount.....                     | 194, 195, 199                                         |
| Africa, Land and sea breezes near coast of.....  | 8                                                     |
| —, Coast of .....                                | 11, 17, 69, 110, 126                                  |
| —, Winds on coast of.....                        | 6, 7, 8                                               |
| Aganis Peak .....                                | 120, 133                                              |
| Agulhas, Bank of.....                            | 7, 73, 74, 89, 97, 102, 103                           |
| —, Cape .....                                    | 69, 103                                               |
| —, Current of .....                              | 69, 71, 72, 73, 74                                    |
| Albany Islands.....                              | 194, 199, 206                                         |
| Albert Reef, <i>see</i> Alert Reef.              |                                                       |
| Albion Islands .....                             | 155                                                   |
| Alert Reef .....                                 | 179, 208                                              |
| Algoa Bay .....                                  | 102, 104                                              |
| Alguada Reef.....                                | 127                                                   |
| Allase Strait.....                               | 100, 135, 140, 142, 154, 157, 158, 177, 182           |
| —, Remarks on Strait of.....                     | 100                                                   |
| —, Eastern route through Strait of.....          | 89                                                    |
| Alligator Island .....                           | 175                                                   |
| Aloo Strait.....                                 | 135, 168                                              |
| —, Remarks on Strait of.....                     | 101                                                   |
| Amblaw Island .....                              | 167                                                   |
| Amboyana Island .....                            | 142, 167, 168                                         |
| —, Winds at Island of .....                      | 56                                                    |
| Ambolon Island .....                             | 153                                                   |
| Ambre, Cape.....                                 | 71                                                    |
| Amoy, Port .....                                 | 64, 174, 176                                          |
| —, Route during N. E. monsoon from Macao to..... | 172, 173, 174                                         |
| Amran Cape, <i>see</i> Ras-Amran.                |                                                       |
| Amsterdam Island .....                           | 97, 99, 136, 139                                      |
| Anambas Islands.....                             | 138, 151, 152, 159, 162, 163, 164                     |
| Anchor Cay .....                                 | 196                                                   |

|                                                                | Page.                                                             |
|----------------------------------------------------------------|-------------------------------------------------------------------|
| Andaman Islands . . . . .                                      | 24, 35, 36, 97, 116, 117, 118, 121, 122, 124, 130, 131, 132       |
| —, Route from north to south in the Gulf of Bengal to east of. | 121                                                               |
| —, Winds in . . . . .                                          | 35, 36                                                            |
| Anjenga, Currents near . . . . .                               | 77                                                                |
| —, Road . . . . .                                              | 77, 90, 107, 108                                                  |
| Anjer, Cape . . . . .                                          | 99                                                                |
| Anno-Bom Island . . . . .                                      | 146                                                               |
| Aor Island, <i>see</i> Pulo-Aor.                               |                                                                   |
| Apo Bank . . . . .                                             | 140, 141, 153                                                     |
| Arabia, Coast of . . . . .                                     | 11, 12, 13, 14, 16, 17, 106, 107, 108, 110, 111, 112              |
| —, Currents on coast of . . . . .                              | 75                                                                |
| —, Currents in Gulf of . . . . .                               | 74                                                                |
| —, Gulf or Bay of . . . . .                                    | 9, 17, 127                                                        |
| —, Special navigation of Gulf of . . . . .                     | 89, 105-115                                                       |
| —, Winds on east coast of . . . . .                            | 14                                                                |
| —, Winds on south coast of . . . . .                           | 11, 12, 13                                                        |
| —, Winds in Gulf of . . . . .                                  | 17                                                                |
| Araacan, Coast . . . . .                                       | 24, 33, 34, 96, 118                                               |
| Arden Island . . . . .                                         | 218                                                               |
| Arrou Islands . . . . .                                        | 59                                                                |
| Arroub or Darnley Island . . . . .                             | 217                                                               |
| Aseir, Cape, <i>see</i> Ras-Aseir.                             |                                                                   |
| Ashmore Banks . . . . .                                        | 211, 212                                                          |
| Asia Islands . . . . .                                         | 146, 157                                                          |
| Astrolabe, Gulf . . . . .                                      | 224                                                               |
| Atagor or Nepean Island . . . . .                              | 217                                                               |
| Atoll, North Currents near . . . . .                           | 78                                                                |
| Atoll, South Currents near . . . . .                           | 78, 79                                                            |
| Australia or New Holland, Continent of . . . . .               | 1, 4, 70, 89, 167, 176, 177, 178,<br>179, 199, 200, 217, 224, 225 |
| —, Current of . . . . .                                        | 69, 70                                                            |
| —, Currents between Islands of Sunda and . . . . .             | 85                                                                |
| —, Navigation on east and northeast coast of . . . . .         | 179-224                                                           |
| —, Routes from India and China to east coast of . . . . .      | 176, 177, 178                                                     |
| —, Winds on northeast coast of . . . . .                       | 207                                                               |
| —, Winds on coasts of . . . . .                                | 42-45                                                             |
| —, Winds between Islands of Sunda and . . . . .                | 42, 43                                                            |
| Ava, Coast . . . . .                                           | 24, 33, 34, 35                                                    |
| Awash Rock . . . . .                                           | 212                                                               |
| Ayou Islands, or Aiou . . . . .                                | 146, 157                                                          |

## B.

|                              |                     |
|------------------------------|---------------------|
| Babel-Mandeb, Cape . . . . . | 108                 |
| —, Strait of . . . . .       | 8, 10, 75, 107, 109 |
| Babuyanes Islands . . . . .  | 145, 156            |
| Bajador, Cape . . . . .      | 138, 141, 171       |
| Balbac Strait . . . . .      | 138, 162, 166, 224  |
| — Island . . . . .           | 138                 |
| Balambangan Island . . . . . | 138, 224            |

|                                                         | Page.                                          |
|---------------------------------------------------------|------------------------------------------------|
| Balasore Road .....                                     | 29, 32, 33, 84, 129                            |
| —, Winds at .....                                       | 32                                             |
| Balintang Channel .....                                 | 145                                            |
| Ball Bank .....                                         | 178                                            |
| Bally, Strait of .....                                  | 100, 135, 139, 142, 159, 165, 166, 177         |
| —, East route for Strait of .....                       | 89                                             |
| —, Winds in Strait of .....                             | 55                                             |
| Bampton Bank .....                                      | 178                                            |
| Banca Strait .....                                      | 93, 136, 147, 151, 153, 158, 160, 169          |
| — Island .....                                          | 135, 158                                       |
| —, Route from Pulo-Aor to Strait of .....               | 151                                            |
| —, Winds in Strait of .....                             | 56                                             |
| Banda Sea .....                                         | 156                                            |
| —, S. E. monsoon, route from Amboyna to Island of ..... | 167                                            |
| Banditti Island .....                                   | 100, 139                                       |
| Banguay Island .....                                    | 168, 224                                       |
| Bantam Bay .....                                        | 99, 127                                        |
| Baragu Point .....                                      | 129                                            |
| Barcelore Peak .....                                    | 114                                            |
| Barren Island, Gulf of Bengal .....                     | 122                                            |
| — Island, China Sea .....                               | 160                                            |
| Barrier Reefs, <i>see</i> Grand Barrier Reefs.          |                                                |
| Bashee, Currents near Islands of .....                  | 87                                             |
| — Islands .....                                         | 65, 145, 156, 225                              |
| Basra, Town .....                                       | 16                                             |
| Bass's Strait .....                                     | 1, 6, 45, 70, 136, 147, 176, 178, 200, 225     |
| Bassas Island .....                                     | 21                                             |
| Bass Island .....                                       | 178                                            |
| Basselan or Basilan Strait .....                        | 154, 155, 168, 224, 226                        |
| — Islands .....                                         | 140                                            |
| Basses, Cape or Point .....                             | 20, 21, 22, 115, 119, 120, 122                 |
| Bassora, Town, <i>see</i> Basra.                        |                                                |
| Batacaran Point .....                                   | 151, 160                                       |
| Batavia Road .....                                      | 99, 127, 155, 168                              |
| —, South route in S. E. monsoon from Moluccas to .....  | 168                                            |
| —, Winds at .....                                       | 56                                             |
| Batchian Strait .....                                   | 155                                            |
| Batenta Island .....                                    | 143                                            |
| Baticolo, To latitude of .....                          | 115                                            |
| Bayn-el-autern, Season .....                            | 13                                             |
| Bear Island .....                                       | 175                                            |
| Bedford, Cape .....                                     | 202                                            |
| Belaat, Wind .....                                      | 12                                             |
| Bellona Bank .....                                      | 178                                            |
| Beloochistan Coast .....                                | 110, 112, 114                                  |
| Bencoolen Port .....                                    | 39, 98, 133                                    |
| Bengal Bay .....                                        | 23, 24, 26, 29, 33, 34, 118                    |
| —, Changes of monsoon in the Gulf of .....              | 24                                             |
| — Channel .....                                         | 130, 131, 132                                  |
| — Coast .....                                           | 33, 34, 115, 119, 120, 121, 127, 128, 141, 152 |
| —, Currents in Gulf of .....                            | 83, 84                                         |



|                                                                                           | Page.                                                     |
|-------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Bengal, Period of leaving ports of the west coast of India for those of the Gulf of ..... | 127                                                       |
| — Gulf ..... 3, 23, 28, 31, 89, 94-96, 104, 108, 110, 115, 139, 158, 167, 182             |                                                           |
| —, Leaving the Bay of, during the S. W. monsoon .....                                     | 124                                                       |
| —, Special navigation in Gulf of .....                                                    | 115                                                       |
| —, General rules for navigating in the Gulf of .....                                      | 125                                                       |
| —, From south to north against the N. E. monsoon in Gulf of ..                            | 118                                                       |
| —, Delay of the N. E. monsoon in Gulf of .....                                            | 25                                                        |
| —, Return from Rangoon to ports of the east coast of the Gulf of .....                    | 128                                                       |
| —, Route in both monsoons from Acheen, or the Strait of Malacca, for .....                | 116, 118, 132                                             |
| —, Route, S. E. monsoon, from Strait of Salayer to .....                                  | 158                                                       |
| —, Route, during S. W. monsoon, from China to Gulf of .....                               | 152                                                       |
| —, Route, during S. W. monsoon, from north to south, in Gulf of .....                     | 123, 124                                                  |
| —, Routes from north to south in Gulf of .....                                            | 119-127                                                   |
| —, Routes from ports of Ceylon and ports of Coromandel to ..                              | 115, 116                                                  |
| —, Routes from coast of Malabar and Ceylon to .....                                       | 115                                                       |
| —, Routes from south to north in the Gulf of .....                                        | 115-119                                                   |
| —, Tempests in Gulf and Bay of .....                                                      | 24                                                        |
| —, Winds in Bay of .....                                                                  | 24                                                        |
| —, Winds in Gulf of .....                                                                 | 23-35                                                     |
| Bessy, <i>see</i> Pulo-Bessy.                                                             |                                                           |
| Bet Island .....                                                                          | 218                                                       |
| Beverly Islands .....                                                                     | 201                                                       |
| Billiton Islands .....                                                                    | 135, 160, 165                                             |
| Bird Island, northeast coast of Australia .....                                           | 180, 199, 205, 207, 219                                   |
| — —, Seychelles .....                                                                     | 126                                                       |
| Black Rock Inlet .....                                                                    | 217                                                       |
| Black Pagoda .....                                                                        | 116                                                       |
| Bligh Channel .....                                                                       | 179, 195-198, 215, 217, 219, 222                          |
| —, directions to go from west to east in Channel of .....                                 | 195-199                                                   |
| —, Tides in Channel of .....                                                              | 198                                                       |
| — Entrance .....                                                                          | 181, 195                                                  |
| —, Route coming from the east for Torres Strait, by Channel of .....                      | 195, 197, 217                                             |
| Bolinao, Cape, or Bolina, Cape .....                                                      | 137, 138, 170, 171                                        |
| Bombay, Currents near .....                                                               | 77                                                        |
| —, Port of .....                                                                          | 17, 18, 19, 89, 90, 92, 105, 106, 111, 114, 127, 135, 165 |
| — Shoals .....                                                                            | 138                                                       |
| Boo Island .....                                                                          | 143, 145, 157                                             |
| Booby Island .....                                                                        | 194, 206, 220, 221                                        |
| — Letter box .....                                                                        | 206                                                       |
| Boong-Ooran Island, <i>see</i> Natuna Island.                                             |                                                           |
| Borneo Island .....                                                                       | 135, 136, 154, 166                                        |
| —, Winds on east coast of .....                                                           | 57                                                        |
| —, Winds on northwest and west coast of .....                                             | 66                                                        |
| —, Winds on south coast of .....                                                          | 56                                                        |
| Boscawen Passage .....                                                                    | 88, 92, 94                                                |

|                                                      | Page.                   |
|------------------------------------------------------|-------------------------|
| Bougainville Strait .....                            | 145                     |
| Bouro, or Bouron Island .....                        | 142, 143, 156, 167, 168 |
| —, Winds at Island of .....                          | 56                      |
| Bouton Strait .....                                  | 142                     |
| — Island, Strait of Malacca, <i>see</i> Pulo-Bouton. |                         |
| — Island, Banda Sea .....                            | 142                     |
| Bowen, Port .....                                    | 201                     |
| Bowling Green, Cape .....                            | 201                     |
| Boydong Cays .....                                   | 199                     |
| Brahalla Channel .....                               | 165                     |
| Brala Island, <i>see</i> Pulo-Brala.                 |                         |
| Bramble Cay .....                                    | 197, 198, 218           |
| Brasse, <i>see</i> Pulo-Brasse.                      |                         |
| Breaker Point .....                                  | 173                     |
| Break Sea-Spit Reef .....                            | 179, 200, 207, 248      |
| Brill Bank .....                                     | 158                     |
| Britto Bank .....                                    | 150                     |
| Brothers, Islands, coast New Holland .....           | 194, 199, 217           |
| — Islands, Red Sea .....                             | 109                     |
| —, Two, Strait of Sunda .....                        | 99                      |
| —, Two, Rocks .....                                  | 173                     |
| Brouwer's Bank .....                                 | 99                      |
| Brown Passage .....                                  | 219                     |
| Buccleugh's Bank .....                               | 144                     |
| Bunker Islands .....                                 | 200                     |
| Burakin Island .....                                 | 141                     |
| Burnt Islands .....                                  | 8, 90, 106, 107         |
| Bushy Island .....                                   | 199                     |
| Button Island, Strait of Sunda .....                 | 99                      |

## C.

|                                                   |                       |
|---------------------------------------------------|-----------------------|
| Cabosa Island .....                               | 130, 131              |
| Cagayan-Sooloo Island .....                       | 168                   |
| Cairncross Island .....                           | 199, 205              |
| Calamianes Islands .....                          | 138, 153              |
| Calivite Point .....                              | 141, 153              |
| Calcutta Port .....                               | 96, 97, 119, 132, 182 |
| Calicut, Currents near .....                      | 77                    |
| Calicut, Road of .....                            | 18, 90, 127           |
| Callao Ray Island, <i>see</i> Pulo-Canton Island. |                       |
| Calymere Point .....                              | 79                    |
| Cambing Island, <i>see</i> Pulo-Cambing.          |                       |
| Cambodia Coast .....                              | 62, 87, 156, 161, 170 |
| —, Currents near coast of .....                   | 62                    |
| —, Winds on coast of .....                        | 62                    |
| Cambrian Rock, <i>see</i> Gadd Rock.              |                       |
| Camel Island .....                                | 160                   |
| Campbell Islet .....                              | 196                   |
| Canara, Coast of .....                            | 17                    |
| Canister Island .....                             | 130                   |

|                                                                        | Page.                                                                                                        |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------|
| Canton Island, <i>see</i> Pulo-Canton.                                 |                                                                                                              |
| —, Road of.....                                                        | 64, 137, 147, 153, 162, 177                                                                                  |
| — River.....                                                           | 87, 147                                                                                                      |
| —, Counter-current of.....                                             | 69, 70, 72                                                                                                   |
| — City.....                                                            | 91                                                                                                           |
| Capone's Point.....                                                    | 170                                                                                                          |
| Capricorn, Cape.....                                                   | 200                                                                                                          |
| Cargados, Carajos, Bank.....                                           | 92, 94                                                                                                       |
| Carimata Island.....                                                   | 159                                                                                                          |
| — Strait.....                                                          | 135, 139, 153, 158, 159, 160, 166, 177                                                                       |
| —, Route against S. E. monsoon from Singapore to Java Sea, by.....     | 166                                                                                                          |
| —, Winds in Strait of.....                                             | 56                                                                                                           |
| Carimon Islands.....                                                   | 38                                                                                                           |
| Carimon-Java Islands.....                                              | 159                                                                                                          |
| Carnicobar Island.....                                                 | 121                                                                                                          |
| Caroline Islands.....                                                  | 146, 225, 226                                                                                                |
| Cato Bank.....                                                         | 180, 223                                                                                                     |
| Catwick Islands.....                                                   | 137, 151, 162                                                                                                |
| Cavite, Port.....                                                      | 171                                                                                                          |
| Ceicer de Mer Island, <i>see</i> Pulo-Ceicer de Mer Island.            |                                                                                                              |
| — de Terre Island, <i>see</i> Pulo-Ceicer de Terre.                    |                                                                                                              |
| Celebes, Island of.....                                                | 57, 138, 139, 140, 142, 155                                                                                  |
| — Sea.....                                                             | 54, 58, 136, 140, 141, 154, 166, 168                                                                         |
| —, Winds in Sea of.....                                                | 58                                                                                                           |
| —, Winds on coast of.....                                              | 57, 58                                                                                                       |
| Centurion Bank.....                                                    | 126                                                                                                          |
| Ceram Island.....                                                      | 142, 157, 167                                                                                                |
| —, Winds at Island of.....                                             | 56                                                                                                           |
| Ceylon, Currents on coast of.....                                      | 79, 80                                                                                                       |
| — Island.....                                                          | 20, 21, 23, 26, 35, 82, 89, 91, 93, 94, 95, 104, 105, 108<br>110, 112, 115-117, 119, 121, 124, 133, 134, 139 |
| —, Route from coast of, Bengal to.....                                 | 121                                                                                                          |
| —, Winds on the coast of.....                                          | 21, 22, 23                                                                                                   |
| Chagos Islands.....                                                    | 93, 94, 108, 126, 134                                                                                        |
| Chang-Chi Island.....                                                  | 175                                                                                                          |
| Chapel Island.....                                                     | 174                                                                                                          |
| Charles Hardy Islands, <i>see</i> Hardy Islands.                       |                                                                                                              |
| Charlotte Bank.....                                                    | 137, 152                                                                                                     |
| Chimmo Pagoda.....                                                     | 174                                                                                                          |
| Chin-Chew Pagoda.....                                                  | 174                                                                                                          |
| China-Bucker Woods.....                                                | 129                                                                                                          |
| China, With the N. E. monsoon from north to south, in Sea of..         | 158, 159                                                                                                     |
| —, Against S. W. monsoon.....                                          | 164                                                                                                          |
| —, Coast of.....                                                       | 16                                                                                                           |
| —, Currents in Sea of.....                                             | 85-87                                                                                                        |
| —, Currents in middle of Sea of.....                                   | 86                                                                                                           |
| —, Currents near south coast of.....                                   | 85, 86                                                                                                       |
| —, Second eastern route to, in December, January, and<br>February..... | 141-146                                                                                                      |
| —, Great eastern routes from Cape to.....                              | 146                                                                                                          |
| —, Sea of.....                                                         | 2, 54, 74                                                                                                    |

|                                                                                     | Page.                                     |
|-------------------------------------------------------------------------------------|-------------------------------------------|
| China, Eastern route in Sea of; end of S. W. or commencement of N. E. monsoon ..... | 162                                       |
| —, S. W. monsoon from south to north, in Sea of .....                               | 160, 161                                  |
| —, Navigation in Sea of .....                                                       | 135-179                                   |
| —, Against N. E. monsoon on east coast of .....                                     | 172-176                                   |
| —, Weak or leaky ships going to .....                                               | 161                                       |
| —, Outer passage in Sea of .....                                                    | 136, 137, 138                             |
| —, Inner passage in Sea of .....                                                    | 136                                       |
| —, During strength of N. E. monsoon with a steamer going up the Sea of .....        | 162                                       |
| —, First eastern route to, in October and November .....                            | 139, 140, 141                             |
| —, Direct route, S. W. monsoon from Cape of Good Hope to .....                      | 136, 137, 138                             |
| —, Route from Palawan to Sea of .....                                               | 138                                       |
| —, Route to south of Mindinao to .....                                              | 141                                       |
| —, Eastern routes from ports of east coast of New Holland, in .....                 | 224, 225, 226                             |
| —, Typhoons in Sea of .....                                                         | 67, 68                                    |
| —, Winds in Sea of .....                                                            | 60-68                                     |
| —, Winds on east coast of .....                                                     | 64, 65                                    |
| —, Winds on south coast of .....                                                    | 64                                        |
| Chittagong Bay .....                                                                | 84                                        |
| — coast .....                                                                       | 24, 33, 34                                |
| Choumay Cape .....                                                                  | 171                                       |
| Christmas Island .....                                                              | 42                                        |
| Chung-Chow Island .....                                                             | 163                                       |
| Chusan Islands .....                                                                | 64, 172, 175, 176                         |
| —, Route in N. E. monsoon from Macao to .....                                       | 172-176                                   |
| Cin, Point .....                                                                    | 169                                       |
| Claremont Islands .....                                                             | 204                                       |
| Clement Channel .....                                                               | 160                                       |
| Cochin, Currents near .....                                                         | 77                                        |
| — road .....                                                                        | 18, 90, 107, 108, 127                     |
| Cochin-China coast .....                                                            | 148, 152, 156, 159, 161, 163, 164, 169    |
| —, Currents near coast of .....                                                     | 86, 87                                    |
| —, Winds on coast of .....                                                          | 63                                        |
| Cockburn Islands .....                                                              | 211                                       |
| — Reef .....                                                                        | 211, 212                                  |
| Cocoanut Island .....                                                               | 195, 218                                  |
| Cocos Islands, Gulf of Bengal .....                                                 | 117, 118, 121, 122, 128, 129, 131         |
| — Islands, Indian Ocean .....                                                       | 98                                        |
| Cole Islands .....                                                                  | 203                                       |
| Collas storms .....                                                                 | 66                                        |
| Colombo Town .....                                                                  | 79                                        |
| Comodo Island .....                                                                 | 158                                       |
| Comoro Island .....                                                                 | 90, 102                                   |
| Comorin, Cape .....                                                                 | 17, 18, 19, 20, 23, 77, 91, 110, 122, 133 |
| —, Currents near Cape .....                                                         | 77                                        |
| Concon, Coast of .....                                                              | 17                                        |
| Condapoor .....                                                                     | 90                                        |
| Condore Island, <i>see</i> Pulo-Condore.                                            |                                           |

|                                                                                  | Page.             |
|----------------------------------------------------------------------------------|-------------------|
| Cook, Mount.....                                                                 | 202               |
| Corkers Rocks.....                                                               | 175               |
| Cornwall, Cape.....                                                              | 192               |
| Coromandel, Coast of .... 21, 22, 23, 24, 26, 27-31, 91, 116, 117, 118, 119, 120 | 121, 127-134, 139 |
| —, Currents on coast of.....                                                     | 83, 84            |
| —, Route from Bengal to ports of coast of.....                                   | 119, 120, 121     |
| —, Route from Mergui to coast of.....                                            | 130, 131          |
| —, Storms on coast of.....                                                       | 28, 29            |
| —, Winds on coast of.....                                                        | 27-31             |
| Corregidor Island, <i>see</i> Mariveles.                                         |                   |
| Corrientes, Cape.....                                                            | 7, 72, 102        |
| Coutch coast.....                                                                | 110               |
| Coutch, Gulf of.....                                                             | 114               |
| —, White squalls in gulf of.....                                                 | 111               |
| Crackatoa Island.....                                                            | 136               |
| — passage.....                                                                   | 98, 99, 136       |
| Cumberland Islands.....                                                          | 201               |
| — Channel.....                                                                   | 219               |
| Cupehi, Point.....                                                               | 173               |
| Current Island.....                                                              | 156               |
| Cutch Gulf, <i>see</i> Coutch.                                                   |                   |

## D.

|                                                            |          |
|------------------------------------------------------------|----------|
| Dalla River.....                                           | 129      |
| Dalrymple Island.....                                      | 217      |
| Damaon, or Damaun Town.....                                | 115      |
| Damauro winds.....                                         | 13       |
| Dampier Strait..... 136, 138, 141, 143, 144, 146, 157, 224 | 144      |
| — —, Tides in.....                                         | 144      |
| Darnley Island..... 180, 181, 196, 197, 198, 217, 222      | 166      |
| Dassee Strait.....                                         | 126      |
| Denis Island.....                                          | 131      |
| Diamond Point.....                                         | 179      |
| Diana Bank.....                                            | 113, 126 |
| Diego Garcia, Island of.....                               |          |
| Dilly Mount, <i>see</i> Mount Dilly.                       |          |
| Direction, Cape.....                                       | 204      |
| Discovery Bank.....                                        | 165      |
| Diu, Cape..... 110, 114                                    | 32       |
| Divy, Point.....                                           | 217      |
| Djeguei or Dungeness Island.....                           |          |
| Docan Island, <i>see</i> Pulo-Docan                        |          |
| Dodd Island.....                                           | 174      |
| Doddington Rock.....                                       | 102      |
| Donda, Cape..... 140, 154                                  | 160      |
| Dordelin Rock.....                                         | 174      |
| Double Cape.....                                           | 201      |
| — Island, Percy group.....                                 |          |
| — Islands, group Prince of Wales Islands.....              | 194, 218 |
| Dove Island.....                                           | 195, 198 |

|                                         | Page.    |
|-----------------------------------------|----------|
| Dryon Strait.....                       | 158, 165 |
| Dumont d'Urville Island .....           | 224      |
| Duncan Channel.....                     | 121, 132 |
| Durcan Strait, <i>see</i> Dryon Strait. |          |

## E.

|                                                               |                                        |
|---------------------------------------------------------------|----------------------------------------|
| Eagle Island .....                                            | 203                                    |
| Eastern Fields Reefs .....                                    | 196, 218                               |
| East Cay .....                                                | 197                                    |
| Eastern Straits, Directions for.....                          | 100, 101                               |
| — Straits, East route for.....                                | 99, 100                                |
| — Straits, Route from India to .....                          | 134                                    |
| — Straits, Route in N. E. monsoon from Pulo-Aor to .....      | 159                                    |
| — Sea Reef Bank .....                                         | 118                                    |
| Edam Island.....                                              | 141                                    |
| Eight Degrees Channel.....                                    | 90, 91, 93, 110                        |
| Elephant Point .....                                          | 128                                    |
| Endeavour Strait, Currents in.....                            | 193                                    |
| — Strait.....                                                 | 191, 192, 193, 194, 195, 198, 206, 221 |
| — Reef.....                                                   | 202                                    |
| — River .....                                                 | 202                                    |
| —, Routes from west to east and east to west in Strait of.... | 191, 192                               |
| Engaño, Cape.....                                             | 156                                    |
| — Island .....                                                | 98                                     |
| Entrance Island.....                                          | 192, 193, 194, 195, 221                |
| — Island, Passage from.....                                   | 192, 193, 194                          |
| Equatorial Channel .....                                      | 79, 94                                 |
| —, Channel currents in .....                                  | 79                                     |
| — Current.....                                                | 69, 70, 71, 72                         |
| — Route .....                                                 | 94, 95                                 |
| Erronan Island.....                                           | 226                                    |
| Escape River .....                                            | 205                                    |
| Europa Island .....                                           | 90, 102                                |
| Europe, Second eastern route from China to.....               | 156, 157                               |
| —, Period for leaving Malabar for .....                       | 127                                    |
| —, N. E. monsoon return from China to .....                   | 147                                    |
| —, First eastern route from China to .....                    | 153-156                                |
| Everard Home, Island of Sir.....                              | 205                                    |
| Eye Island.....                                               | 157                                    |

## F.

|                                     |     |
|-------------------------------------|-----|
| Fairway Bank .....                  | 145 |
| False Bay.....                      | 178 |
| Farewell Islet.....                 | 217 |
| Farquhar Reef .....                 | 179 |
| Fartak Cape, <i>see</i> Ras-Fartak. |     |
| Fataka .....                        | 226 |
| Feejee Islands.....                 | 226 |
| Fisher's Island .....               | 143 |
| Fitz-Roy Island .....               | 201 |

|                                                                    | Page.                                              |
|--------------------------------------------------------------------|----------------------------------------------------|
| Flat Island, northeast coast of Australia .....                    | 201                                                |
| — —, Java Sea .....                                                | 158                                                |
| Flattery Cape .....                                                | 203                                                |
| Flinders' Bank .....                                               | 183                                                |
| — Cape .....                                                       | 203, 204, 205                                      |
| — Islands .....                                                    | 203                                                |
| — Passage .....                                                    | 219                                                |
| Flores Strait .....                                                | 101, 135                                           |
| — Island .....                                                     | 101, 168                                           |
| —, Remarks on Strait of .....                                      | 101                                                |
| Fly Bank .....                                                     | 183                                                |
| — Passage .....                                                    | 219                                                |
| Formosa, Currents in Strait of .....                               | 86                                                 |
| —, Strait of .....                                                 | 64, 65, 136, 141, 146, 172, 173-175, 177, 225, 226 |
| — Island .....                                                     | 64, 145, 172, 173, 175, 176                        |
| — Passage .....                                                    | 175, 176, 225                                      |
| —, Route from Dampier Straits to Passage of .....                  | 144                                                |
| —, Route up east coast of China, N. E. monsoon, by Strait of ..... | 172-175                                            |
| —, Winds, Channel of .....                                         | 65                                                 |
| Fou-Chow-Fou Town .....                                            | 175                                                |
| Foul Island .....                                                  | 144                                                |
| Four Brothers Islands .....                                        | 168                                                |
| Frankland Islands .....                                            | 201                                                |
| Frederic Bank .....                                                | 178                                                |
| — Hendrick Rocks .....                                             | 151                                                |
| Friar's Hood, Mount .....                                          | 134                                                |

## G.

|                                    |                                        |
|------------------------------------|----------------------------------------|
| Gadd Rock .....                    | 145                                    |
| Gagy Island .....                  | 145, 167                               |
| Galera, Point .....                | 140                                    |
| Galion, Island of .....            | 140, 165, 168, 177                     |
| Galle, Point de .....              | 21, 22, 23, 79, 80, 91, 95, 110, 135   |
| Ganges, River .....                | 23, 32, 84                             |
| Gaspar Strait .....                | 135, 136, 147, 152, 153, 159, 160      |
| — Island .....                     | 159, 160                               |
| —, Winds in Strait of .....        | 56                                     |
| Gass Island, <i>see</i> Pulo-Gass. |                                        |
| Geby Island .....                  | 145, 167                               |
| Geldria Shoal .....                | 151                                    |
| Gilibanta Island .....             | 101, 158                               |
| Gilmore Bank .....                 | 199                                    |
| Gilolo Strait .....                | 136, 141, 143, 145, 155, 157, 166, 167 |
| — Island .....                     | 57, 146, 155                           |
| Goa Road .....                     | 90                                     |
| Goat Island .....                  | 138, 141, 171                          |
| Golconda, Coast of .....           | 24                                     |
| —, Currents on coast of .....      | 83                                     |
| —, Winds on coast of .....         | 32                                     |
| Gonave Channel .....               | 41                                     |

|                                                               | Page.                                                                                             |
|---------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| Goode Island .....                                            | 194, 206, 218                                                                                     |
| Good Hope, Cape .....                                         | 1, 7, 54, 74, 88-101, 101-105, 127, 135, 136,<br>139, 141, 142, 146, 147, 153, 155, 177, 224, 225 |
| — Instructions for doubling .....                             | 102-104                                                                                           |
| — Routes from ports of the Indian Ocean to .....              | 101, 102                                                                                          |
| Goonoug-Apee Island .....                                     | 158                                                                                               |
| Gordeware, Point .....                                        | 123                                                                                               |
| Gouap Island .....                                            | 144, 225                                                                                          |
| Goulou Island .....                                           | 144, 225                                                                                          |
| Grafton, Cape .....                                           | 201, 207                                                                                          |
| Grand Channel, <i>see</i> Brahalla Channel.                   |                                                                                                   |
| Great Strait .....                                            | 108, 109                                                                                          |
| Great Barrier Reefs .....                                     | 196, 198, 199, 201, 208-223                                                                       |
| Green Island .....                                            | 163                                                                                               |
| Grenville, Cape .....                                         | 199, 205                                                                                          |
| Greyhound Channel .....                                       | 155                                                                                               |
| Grove Pass .....                                              | 219, 220                                                                                          |
| Guadel, Cape .....                                            | 17                                                                                                |
| Guam Island .....                                             | 225                                                                                               |
| Guardafui, Cape .....                                         | 7, 8, 11, 73, 106, 107, 108, 126                                                                  |
| Guebe Island .....                                            | 145, 167                                                                                          |
| Gueborar Island, or Brothers Island, coast of New Guinea .... | 217                                                                                               |
| Guinea, Island of New, <i>see</i> New Guinea.                 |                                                                                                   |
| Gulf Stream, Current .....                                    | 72                                                                                                |
| Gunung-API Island, Banda Sea .....                            | 168                                                                                               |
| Guzerat, Coast .....                                          | 17                                                                                                |
| Gwadel, <i>see</i> Guadel.                                    |                                                                                                   |

## H.

|                                                   |                                  |
|---------------------------------------------------|----------------------------------|
| Hafoon, Cape, <i>see</i> Ras-Hafoon.              |                                  |
| Haggerston Island .....                           | 205                              |
| Hai-Ling-Shan Port .....                          | 161                              |
| Hainan, Currents near .....                       | 86                               |
| —, Island of .....                                | 64, 147, 152, 158, 161, 163, 171 |
| Half Moon Bank .....                              | 138                              |
| Hammond Island .....                              | 155, 194, 206                    |
| Hanglip, Cape .....                               | 103                              |
| Hannibal Islands .....                            | 199                              |
| Hardy Islands .....                               | 210, 211, 212, 213, 214          |
| Harlem Bay .....                                  | 172                              |
| Harvey Rocks .....                                | 195                              |
| Hastings Island .....                             | 139                              |
| Haycock Island .....                              | 160                              |
| Helen Reef .....                                  | 156                              |
| Hie-Che-Chin Bank .....                           | 173                              |
| High Green Island .....                           | 163                              |
| Hih-Shan Island .....                             | 175                              |
| Hindustan, alternate breezes, West coast of ..... | 18, 19                           |
| — Country, or India .....                         | 3, 9, 17, 18, 19, 20             |
| —, Currents on West coast of .....                | 77                               |



|                                        | Page.                  |
|----------------------------------------|------------------------|
| Hindustan Rock.....                    | 99                     |
| —, Winds on west coast of.....         | 17, 18, 19, 20         |
| Hog Island, Straits of Malacca.....    | 135                    |
| — —, Java Sea.....                     | 168                    |
| Holbourne Island.....                  | 201                    |
| Holland's Bank.....                    | 149, 150               |
| Hong Kong Road.....                    | 162, 163, 172          |
| Hooe Tow Bay.....                      | 174                    |
| Hoo-Tow-Sham Bay.....                  | 173                    |
| Hoogly River.....                      | 34, 116, 118, 120, 121 |
| Hope Islands Reef.....                 | 202                    |
| Horned Hill Point.....                 | 206                    |
| Hougar Island, or Stephens Island..... | 196                    |
| Howe, Cape.....                        | 45                     |
| —, Island.....                         | 178, 223, 225          |
| Howick Islands.....                    | 203                    |
| Hurricanes, Currents of.....           | 53                     |
| —, General laws, &c.....               | 47-54                  |
| —, Undulations of.....                 | 53                     |
| —, Nautical directions to escape.....  | 229-238                |
| Hutan Bay, <i>see</i> Hoo-Tow-Sham.    |                        |

## I.

|                                                                               |               |
|-------------------------------------------------------------------------------|---------------|
| Ilchester Shoal.....                                                          | 151           |
| Ilin Island.....                                                              | 153           |
| India, N. E. monsoon, return from China to.....                               | 147           |
| —, N. W. monsoon, eastern route from Amboyna to.....                          | 168           |
| —, S. W. monsoon, second eastern route from China to.....                     | 156, 158      |
| —, S. W. monsoon, first eastern route from China to.....                      | 153-156       |
| —, Route by Strait of Malacca to west coast of.....                           | 132           |
| —, Route by Strait of Sunda to ports of.....                                  | 133-135       |
| —, Eastern route from east coast of New Holland to.....                       | 224, 225, 226 |
| —, Outer route from Sidney to.....                                            | 207-216       |
| —, Route from Persian Gulf to ports of.....                                   | 114           |
| —, Inner route from Sidney to.....                                            | 200-207       |
| —, Route from Mauritius to.....                                               | 94, 95        |
| —, Northern route from ports of east to those of the west coast of.....       | 125, 126      |
| —, Route from Port Jackson, by Pitt Passage, to.....                          | 223, 224      |
| —, Route from Réunion to.....                                                 | 94, 95        |
| —, Southern route, in S. E. monsoon, from Amboyna to.....                     | 168           |
| —, Southern route from east coast of New Holland to.....                      | 178           |
| —, Northern routes from east coast of New Holland to.....                     | 178           |
| —, Return routes from China to.....                                           | 147, 158      |
| —, Southern route from the east to the west coast of.....                     | 126           |
| —, Routes from Sidney to.....                                                 | 200-216       |
| —, Winds on coast of.....                                                     | 2             |
| —, Bassas da.....                                                             | 90, 102       |
| Indian Ocean, Land and sea breezes in.....                                    | 6             |
| — —, Chances of change of weather, according to phases of<br>the moon in..... | 15, 16        |

|                                                  | Page.  |
|--------------------------------------------------|--------|
| Indian Ocean, Currents of .....                  | 69-85  |
| — —, Great routes in .....                       | 88-105 |
| — —, Limits of .....                             | 1      |
| — —, Monsoons in .....                           | 2-6    |
| — —, Navigation of .....                         | 88-135 |
| — —, Hurricanes in .....                         | 47-54  |
| — —, Seasons of .....                            | 5, 6   |
| — —, Trade-winds in .....                        | 1, 2   |
| — —, Winds in .....                              | 1-54   |
| — —, Variable winds in .....                     | 2      |
| Indus, Current of .....                          | 76     |
| Interior Passage, <i>see</i> Mozambique Passage. |        |
| Investigator, Shoal .....                        | 164    |

## J.

|                                     |                                                            |
|-------------------------------------|------------------------------------------------------------|
| Jackson Island .....                | 143                                                        |
| — —, Port, <i>see</i> Port Jackson. |                                                            |
| Jaffnapatam Town .....              | 21                                                         |
| Jaguernaut, Pagodas .....           | 116                                                        |
| Jask, Cape, <i>see</i> Ras-Jask.    |                                                            |
| Java, Cape .....                    | 97, 98, 100, 133                                           |
| — —, Currents near coast of .....   | 85                                                         |
| — — Island .....                    | 40, 41, 55, 98, 99, 100, 134, 139, 141, 159, 165, 166, 169 |
| — — Sea .....                       | 4, 54, 98, 101, 142, 155, 160, 164, 166, 183, 223          |
| — —, Winds in Sea of .....          | 55, 56                                                     |
| — —, Winds on south coast of .....  | 41                                                         |
| Jeddah, Town .....                  | 75                                                         |
| Jervis Island .....                 | 217                                                        |
| Jibbel-Teer, Mount .....            | 10                                                         |
| Jokako, Point .....                 | 173                                                        |
| Juan de Nova, Island .....          | 102                                                        |
| Jubal, Strait of .....              | 11                                                         |
| Junk Ceylon, Currents near .....    | 84                                                         |
| — — Island .....                    | 118, 121, 122, 128, 129                                    |

## K.

|                                                          |               |
|----------------------------------------------------------|---------------|
| Kalkoon, Island and Shoals of .....                      | 140           |
| Kanary Islands .....                                     | 143           |
| Kangelang Island .....                                   | 168           |
| Kanneeoongan, Point .....                                | 154           |
| Karikal, Road .....                                      | 125           |
| Karwan, Cape, <i>see</i> Ras-Karwan.                     |               |
| Keeling Islands, <i>see</i> Cocos Islands, Indian Ocean. |               |
| Kekek Island .....                                       | 145, 157      |
| Kenn's Bank .....                                        | 178, 180, 218 |
| Kew-Shan Island .....                                    | 175, 176      |
| King William's Cape .....                                | 224           |
| — — Island .....                                         | 157           |
| Kirinde .....                                            | 82            |
| Koorya-Moorya, Bay of .....                              | 12, 13        |

|                                            | Page.                                                 |
|--------------------------------------------|-------------------------------------------------------|
| Krakatoa, <i>see</i> Crackatou.            |                                                       |
| Kundary, Island of .....                   | 90, 114, 127                                          |
| L.                                         |                                                       |
| Laccadives, Currents near .....            | 78                                                    |
| —, Islands .....                           | 90, 107, 110, 111, 112, 114, 115, 127                 |
| —, Winds at Islands of .....               | 20                                                    |
| Ladrone, Islands .....                     | 137, 148, 151, 152, 153, 162, 170                     |
| Lady Elliot Island .....                   | 200                                                   |
| Lam-Yit, Island of .....                   | 174                                                   |
| Lamb Island .....                          | 178                                                   |
| Lamock Islands .....                       | 173                                                   |
| Landfall Island .....                      | 122, 128                                              |
| Lantao Island .....                        | 163                                                   |
| Lantinga Island, <i>see</i> Pulo-Lantinga. |                                                       |
| Larga, Island of .....                     | 98                                                    |
| Larne Island .....                         | 175                                                   |
| — Rock .....                               | 175                                                   |
| Laut Islands, <i>see</i> Pulo-Laut.        |                                                       |
| Leat Island, <i>see</i> Pulo-Leat.         |                                                       |
| Lee-o-Loo, Bay of .....                    | 174                                                   |
| Leeuwin, Cape .....                        | 43, 44, 69, 70, 100, 146, 200                         |
| Lema Channel .....                         | 156, 170                                              |
| — Islands .....                            | 138, 171, 175                                         |
| Liant, Cape .....                          | 169                                                   |
| Lingin Island .....                        | 151, 165, 166                                         |
| Lisatika, Point .....                      | 167                                                   |
| Lissa-Matula Island .....                  | 155                                                   |
| Little Strait Channel .....                | 108, 109                                              |
| Lizard Island .....                        | 203                                                   |
| Lombock Strait .....                       | 100, 135, 139, 142, 159, 165, 166, 177                |
| — Island .....                             | 100, 165, 166, 168, 182                               |
| —, Remarks on Strait of .....              | 100                                                   |
| —, Eastern route for Strait of .....       | 89, 99                                                |
| Long Island, China Sea .....               | 160                                                   |
| — Island, Blight Passage .....             | 195                                                   |
| — Island, Pacific Ocean .....              | 224                                                   |
| Lookout, Point .....                       | 203                                                   |
| Lord North Island .....                    | 156                                                   |
| Lottin Island .....                        | 224                                                   |
| Louisa Shoal .....                         | 138                                                   |
| Low Island, Anambas .....                  | 138                                                   |
| Low-wooded Island .....                    | 202                                                   |
| Luban Island .....                         | 141                                                   |
| Lubeck Island .....                        | 165                                                   |
| Luzon, Current near west coast of .....    | 86, 87                                                |
| — Island .....                             | 137, 138, 140, 141, 145, 152, 153, 158, 162, 170, 225 |
| —, Winds near the coast of .....           | 66                                                    |
| Lucepara Islands .....                     | 168                                                   |
| Ly-ee-Moon Passage .....                   | 172                                                   |

## M.

|                                                                             | Page.                                                                                                                         |
|-----------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------|
| Ma-Urh, Cape .....                                                          | 173, 176                                                                                                                      |
| Mabo, Cape .....                                                            | 143, 157                                                                                                                      |
| Macala Town, <i>see</i> Makallah.                                           |                                                                                                                               |
| Macao Road .....                                                            | 64, 87, 141, 146, 151, 153, 156,<br>158, 161, 163, 164, 170, 171, 172                                                         |
| —, Route from Manilla to .....                                              | 170, 171                                                                                                                      |
| —, Route from Pulo-Aor to .....                                             | 136, 137                                                                                                                      |
| —, Route from Hong Kong to .....                                            | 163                                                                                                                           |
| Macassar Bay .....                                                          | 140                                                                                                                           |
| — Strait .....                                                              | 136, 139, 140, 141, 154, 155                                                                                                  |
| —, Winds in Strait of .....                                                 | 57                                                                                                                            |
| Macelesfield Bank .....                                                     | 136, 137, 147, 151, 152, 153, 159, 160, 164, 170                                                                              |
| — Channel .....                                                             | 160                                                                                                                           |
| Madagascar, Archipelago of .....                                            | 93, 102                                                                                                                       |
| —, Counter-current on west coast of .....                                   | 73                                                                                                                            |
| —, Island of .....                                                          | 1, 5, 6, 48, 71, 73, 90, 91, 92, 93, 104, 148                                                                                 |
| —, Monsoons on the east coast of .....                                      | 5                                                                                                                             |
| —, Passage to east of .....                                                 | 90, 91, 92                                                                                                                    |
| Madras, Port .....                                                          | 91, 95, 96, 105, 116, 117, 119, 125, 129, 131, 132, 134, 182                                                                  |
| —, Route from Strait of Malacca to .....                                    | 132                                                                                                                           |
| Madura Island .....                                                         | 159, 169, 177                                                                                                                 |
| Mahé Road .....                                                             | 89, 90, 127, 135, 165                                                                                                         |
| Mait Islands, <i>see</i> Burnt Islands.                                     |                                                                                                                               |
| Makallah Town .....                                                         | 9                                                                                                                             |
| Malabar Coast .....                                                         | 6, 17, 21, 23, 27, 78, 83, 92, 93, 106, 107, 110, 111,<br>114, 115, 120, 122, 127, 135, 139                                   |
| —, Period for passages from Coromandel Coast to .....                       | 127                                                                                                                           |
| Malacca, Currents in the Strait of .....                                    | 83, 85                                                                                                                        |
| —, Currents near east coast of Peninsula of .....                           | 85                                                                                                                            |
| — Strait .....                                                              | 24, 26, 37, 84, 85, 88, 116, 117, 118, 121, 122, 127, 128, 129,<br>131, 132, 135, 139, 147, 153, 158, 165, 166, 167, 168, 169 |
| —, Northwest squalls in Strait of .....                                     | 38                                                                                                                            |
| —, Route to east of Amboyna or the Moluccas to, in N. W. mon-<br>soon ..... | 167                                                                                                                           |
| —, Peninsula of .....                                                       | 37, 87                                                                                                                        |
| —, Road of .....                                                            | 38, 132                                                                                                                       |
| —, Routes from Bengal to Straits of .....                                   | 121, 122                                                                                                                      |
| —, Winds on east coast of Peninsula of .....                                | 62                                                                                                                            |
| —, Winds in Straits of .....                                                | 37, 38                                                                                                                        |
| Malay Peninsula, <i>see</i> Malacca.                                        |                                                                                                                               |
| Malays .....                                                                | 59                                                                                                                            |
| Maldives, Currents in the .....                                             | 78, 79                                                                                                                        |
| —, Islands .....                                                            | 93, 107, 108, 110, 113, 135                                                                                                   |
| —, Winds in Islands of .....                                                | 21                                                                                                                            |
| Malora Island, <i>see</i> Pulo-Malora.                                      |                                                                                                                               |
| Momori Cape .....                                                           | 224                                                                                                                           |
| Manar Gulf .....                                                            | 23, 79, 91, 135                                                                                                               |
| Mancap Island, <i>see</i> Pulo-Mancap.                                      |                                                                                                                               |
| Magalore Road .....                                                         | 18, 107                                                                                                                       |
| Mangsee Islands .....                                                       | 168                                                                                                                           |

|                                                                                   | Page.                                      |
|-----------------------------------------------------------------------------------|--------------------------------------------|
| Manilla Port .....                                                                | 59, 162, 169, 170, 171                     |
| —, Route from Macao to .....                                                      | 170                                        |
| —, Route in S. W. monsoon from Pulo-Sapata to .....                               | 171                                        |
| —, Route from Pulo-Condore to .....                                               | 170                                        |
| Manipa Island .....                                                               | 143, 156, 167                              |
| Manopin Peak .....                                                                | 160                                        |
| Mansfield Bank .....                                                              | 142                                        |
| Maregoland Island .....                                                           | 155                                        |
| Margaret Bay .....                                                                | 205                                        |
| Mariannas Islands .....                                                           | 3, 65, 146, 225                            |
| Marière Island .....                                                              | 156                                        |
| Mariveles Island .....                                                            | 171                                        |
| Martaban, Coast of .....                                                          | 24, 35, 36, 128                            |
| —, Gulf of .....                                                                  | 36                                         |
| —, Winds on coast of .....                                                        | 35, 36                                     |
| Massera, Gulf .....                                                               | 113                                        |
| Masulipatam Road .....                                                            | 32                                         |
| Matthews Island .....                                                             | 226                                        |
| Matsore Island .....                                                              | 175                                        |
| Mauritius Island .....                                                            | 46, 47, 71, 92, 94, 105, 127               |
| —, Route from Cape of Good Hope to .....                                          | 94                                         |
| —, Winds on coast of .....                                                        | 46                                         |
| Mauvais Channel .....                                                             | 217                                        |
| Mayotta Island .....                                                              | 90, 102                                    |
| Meangis Islands .....                                                             | 141, 168                                   |
| Meia-co-Sima Islands .....                                                        | 176                                        |
| Mellish Reef .....                                                                | 179                                        |
| Mellville, Cape .....                                                             | 203                                        |
| — Island .....                                                                    | 4, 42                                      |
| Mendoza, Island .....                                                             | 172                                        |
| Mergui Islands .....                                                              | 128, 130                                   |
| —, Route from Coromandel Coast to .....                                           | 130                                        |
| Merope Bank .....                                                                 | 174                                        |
| Middle Banks .....                                                                | 199, 210, 211                              |
| — Passage, Directions for .....                                                   | 211                                        |
| — Passage or channel .....                                                        | 199                                        |
| — Channel, Strait of Sunda .....                                                  | 99                                         |
| — Island .....                                                                    | 99                                         |
| — Passage .....                                                                   | 88, 90, 93, 94, 102                        |
| Middleton Island .....                                                            | 223, 225                                   |
| Mindinao Island .....                                                             | 58, 138, 140, 141, 154, 162, 168, 224, 226 |
| Minder's Rocks .....                                                              | 159                                        |
| Mindoro, Strait .....                                                             | 153, 226                                   |
| — Island .....                                                                    | 137, 153, 162                              |
| Minerva Bank .....                                                                | 178                                        |
| Minicoy Island .....                                                              | 91                                         |
| Mintao Island, <i>see</i> Pulo-Mintao.                                            |                                            |
| Mir Bay .....                                                                     | 172                                        |
| Mocha Town .....                                                                  | 10, 11, 76, 109, 110                       |
| Mohilla Island .....                                                              | 90                                         |
| Moluccas Islands, end of S. W. monsoon, routes from Strait of<br>Malacca to ..... | 138                                        |

|                                           | Page.                   |
|-------------------------------------------|-------------------------|
| Moluccas Passage .....                    | 154, 155, 166           |
| — Islands .....                           | 4, 136, 138, 167, 168   |
| — Sea .....                               | 54, 183                 |
| —, Winds in sea of .....                  | 55, 56, 57              |
| Monopin Peak .....                        | 160                     |
| Monsoons, Winds .....                     | 2                       |
| Mount Dilly .....                         | 107                     |
| Montague, Cape .....                      | 175                     |
| Montaran Banks .....                      | 165                     |
| — Islands .....                           | 165                     |
| Morty Island .....                        | 141                     |
| Mouarree, Cape .....                      | 114                     |
| Mouse Rock .....                          | 175                     |
| Mozambique Channel .....                  | 5, 72, 73, 89, 101, 102 |
| —, Current of .....                       | 72, 73                  |
| —, Monsoon in channel of .....            | 5, 6                    |
| —, Interior passage or Passage of .....   | 89, 90, 91              |
| —, Storms in channel of .....             | 6                       |
| Mulgrave Island .....                     | 217                     |
| Murray Islands .....                      | 219                     |
| Muscat, Route direct from Bombay to ..... | 113                     |
| —, Southern route from Bombay to .....    | 112, 113                |
| —, Town .....                             | 14, 111, 112, 113       |
| Mysory Island .....                       | 224                     |

## N.

|                                                                  |                                           |
|------------------------------------------------------------------|-------------------------------------------|
| Narcondam Island .....                                           | 118, 128, 129                             |
| Naso Point .....                                                 | 140, 154                                  |
| Natal Bay, <i>see</i> Port Natal.                                |                                           |
| — Coast .....                                                    | 102                                       |
| Natuna Island, Great .....                                       | 138                                       |
| Natunas Islands .....                                            | 152, 160, 162, 164, 177                   |
| Negapatam Road .....                                             | 124                                       |
| Negraia, Cape .....                                              | 36, 84, 117, 121, 127, 128, 132           |
| Negro Island .....                                               | 140, 162                                  |
| New Britain Island .....                                         | 224                                       |
| New Caledonia Island .....                                       | 147, 225, 226                             |
| — —, Winds on west coast of .....                                |                                           |
| New Guinea Island .....                                          | 4, 144, 195, 196, 198, 218, 222, 223, 224 |
| — —, Winds on west coast of .....                                | 57                                        |
| New Holland, Continent of, or Australia .....                    | 1, 4,                                     |
|                                                                  | 69, 89, 167, 176, 177, 179, 199, 200, 225 |
| — —, Currents between Islands of Sunda and .....                 | 85                                        |
| — —, Navigation on east and northeast coast of .....             | 179–224                                   |
| — —, Routes from India and China to ports of east coast of ..... | 176,                                      |
|                                                                  | 177, 178                                  |
| — —, Winds between Islands of Sunda and .....                    | 42, 43                                    |
| New Holland, Winds on the northeast coast of .....               | 207                                       |
| — —, Winds on northwest, west, and south coasts of .....         | 42–45                                     |
| New Ireland Island .....                                         | 223                                       |
| New Hebrides Islands .....                                       | 146, 147, 225, 226                        |

|                                        | Page.                                                      |
|----------------------------------------|------------------------------------------------------------|
| Nicholl's Cay .....                    | 217                                                        |
| Nicobar, Currents near Island of ..... | 83                                                         |
| — Islands .....                        | 26, 35, 36, 96, 97, 116, 117, 118, 124, 125, 128, 129, 132 |
| —, Winds in Islands of .....           | 35, 36                                                     |
| Night Island .....                     | 204, 205                                                   |
| Nimrod Entrance .....                  | 219, 221                                                   |
| Nine Degrees Channel .....             | 78, 90, 91, 93, 107, 108, 127                              |
| —, Currents in the .....               | 78                                                         |
| Ninepin Rock .....                     | 172                                                        |
| Noesa-Seras Islands .....              | 155                                                        |
| Norfolk Island .....                   | 226                                                        |
| —, Cape, Island of Morty .....         | 141                                                        |
| North Channel .....                    | 199                                                        |
| — Channel, Strait of Sunda .....       | 99                                                         |
| — Channel, directions for .....        | 211                                                        |
| Northwest Cape, Australia .....        | 42, 99, 100                                                |
| — Reef .....                           | 194                                                        |
| Northumberland Channel .....           | 153                                                        |
| — Islands .....                        | 201                                                        |
| Norway Islands .....                   | 172                                                        |
| Nouka-Hiva, Archipelago .....          | 4                                                          |
| Nounabaron Island, or Nusa-Baron ..... | 134                                                        |

## O.

|                                         |                                     |
|-----------------------------------------|-------------------------------------|
| Oby Island, <i>see</i> Pulo-Oby.        |                                     |
| Oby-Major Island .....                  | 143, 155, 167                       |
| Ock-Seu Islands .....                   | 174                                 |
| Oman Gulf, <i>see</i> Arabia Gulf.      |                                     |
| Ombay Strait .....                      | 135, 142, 155, 157, 223             |
| — Island .....                          | 142, 156, 168, 183                  |
| —, N. W. monsoons from Amboyna to ..... | 167, 168                            |
| —, Remarks on Strait of .....           | 101                                 |
| —, Eastern route for Strait of .....    | 89                                  |
| One-and-a-half Degree Channel .....     | 91, 93, 94                          |
| Orfui, Cape .....                       | 106                                 |
| Orixa Coast .....                       | 24, 32, 33, 115, 116, 117, 120, 123 |
| —, Currents on coast of .....           | 83                                  |
| —, Winds on coast of .....              | 32, 33                              |
| Ormus Strait .....                      | 14                                  |
| — Town .....                            | 16                                  |
| Orman Reef .....                        | 217                                 |
| Osprey Reef .....                       | 207                                 |
| Outer, Second passage .....             | 89, 96, 97                          |
| —, First passage .....                  | 88, 95                              |

## P.

|                                 |                           |
|---------------------------------|---------------------------|
| Paanopa Island .....            | 146                       |
| Padaran, Cape .....             | 63, 86, 87, 149, 150, 162 |
| —, Currents near Cape .....     | 86                        |
| — Bay .....                     | 149                       |
| Pagoda Cape, <i>see</i> Varela. |                           |

|                                                             | Page.                                           |
|-------------------------------------------------------------|-------------------------------------------------|
| Paix Rock.....                                              | 151                                             |
| Palao Islands, <i>see</i> Pelew Islands.                    |                                                 |
| Palawan, Currents on coasts of .....                        | 86, 87                                          |
| — Island .....                                              | 60, 138                                         |
| — Route .....                                               | 138, 162                                        |
| —, Winds on coast of .....                                  | 60, 66                                          |
| Palk Bay.....                                               | 21, 23, 120, 124                                |
| —, Bay Currents in .....                                    | 79                                              |
| Palm Islands.....                                           | 201                                             |
| Palmyras, False Point .....                                 | 117, 123                                        |
| — Point or Cape .....                                       | 21, 22, 25, 115, 117, 118, 119, 121, 122        |
| Panaon Strait.....                                          | 226                                             |
| Panay Island.....                                           | 140, 153                                        |
| Pandora Entrance.....                                       | 214                                             |
| Panjang Island, <i>see</i> Pulo-Panjang.                    |                                                 |
| Panthar Strait .....                                        | 135, 168                                        |
| — Strait, Remarks on .....                                  | 101                                             |
| Papous, Land of, <i>see</i> New Guinea.                     |                                                 |
| Paracel, Current near .....                                 | 87                                              |
| — Islands and banks .....                                   | 63, 136, 147, 148, 152, 158, 160, 161, 163, 164 |
| Parcelar, Mt.....                                           | 38                                              |
| Passage Island .....                                        | 217                                             |
| Passages, Currents in seas of .....                         | 87                                              |
| —, Navigation in seas of .....                              | 135-160                                         |
| —, Winds in seas of .....                                   | 54-60                                           |
| Patahecock Island .....                                     | 175                                             |
| Pater Noster Islands.....                                   | 155                                             |
| Patientia Strait .....                                      | 155                                             |
| Peaked Island .....                                         | 201                                             |
| Pedir Coast.....                                            | 38, 129, 132                                    |
| Pedra Branca.....                                           | 184                                             |
| Pedro Point.....                                            | 79                                              |
| Pedro Blanco Rocks.....                                     | 145, 173                                        |
| Pegu, Coast of .....                                        | 24, 33, 34, 128, 129                            |
| Pelew Islands.....                                          | 141, 144, 156, 225                              |
| Pelican Island .....                                        | 204                                             |
| Penang .....                                                | 184                                             |
| Pera Island, <i>see</i> Pulo-Pera.                          |                                                 |
| Percy Islands.....                                          | 201                                             |
| Perem Island.....                                           | 108, 109                                        |
| Persia, Coast of .....                                      | 16, 17, 111                                     |
| —, Currents, coast of .....                                 | 76                                              |
| —, Currents, Gulf of .....                                  | 76                                              |
| —, Gulf of.....                                             | 13, 101, 102, 110, 111, 114, 125, 126           |
| —, Rains, coast of .....                                    | 16                                              |
| —, Route from Cape of Good Hope to Gulf of .....            | 92                                              |
| —, Southern route from Bombay to Gulf of .....              | 112, 113, 114                                   |
| —, Southern route from east coast of India to Gulf of ..... | 126                                             |
| —, Routes from India to Gulf of .....                       | 110-114                                         |
| —, Favorable season from India to Gulf of .....             | 110                                             |
| —, Winds in Gulf of .....                                   | 114-116                                         |



|                                                           | Page.                                                                      |
|-----------------------------------------------------------|----------------------------------------------------------------------------|
| Perth Town.....                                           | 43                                                                         |
| Philippine Islands.....                                   | 3, 65, 67, 136, 140, 156, 226                                              |
| — — —, Storms of.....                                     | 66                                                                         |
| — — —, Winds in.....                                      | 65, 66                                                                     |
| Phuyen Bay.....                                           | 148                                                                        |
| Pipon Island.....                                         | 203                                                                        |
| Pigeon Island, Dampier Strait.....                        | 144                                                                        |
| Pigeons Island, west coast of India.....                  | 90                                                                         |
| Pigot Point.....                                          | 144, 157                                                                   |
| Pih-Seang Island.....                                     | 175                                                                        |
| Pine Peak Islands.....                                    | 201                                                                        |
| Piper Island.....                                         | 204, 205                                                                   |
| Pisang Island, <i>see</i> Pulo-Pisang.                    |                                                                            |
| Pitt Strait.....                                          | 136, 143                                                                   |
| — Passage.....                                            | 136, 139, 141, 142, 143, 145, 155, 156, 157, 224                           |
| Poll Island.....                                          | 218                                                                        |
| Pollard Channel.....                                      | 199, 211, 212, 213                                                         |
| — — —, Directions for.....                                | 212                                                                        |
| Pomatou, Archipelago.....                                 | 4                                                                          |
| Pondichery Road.....                                      | 96, 97, 104, 105, 117, 119, 125, 127, 128, 129, 131,<br>132, 133, 134, 139 |
| — — —, Route from Strait of Malacca to.....               | 132                                                                        |
| Pondy Island.....                                         | 140, 159, 165, 177                                                         |
| Popo Island, <i>see</i> Pulo-Popo.                        |                                                                            |
| Port au Prince.....                                       | 41                                                                         |
| Port Jackson.....                                         | 176, 178, 220, 223, 224, 225                                               |
| Port Louis.....                                           | 46                                                                         |
| Port Natal.....                                           | 71, 72, 73                                                                 |
| Portlock Reefs.....                                       | 196, 218, 222                                                              |
| Possession Islands.....                                   | 193, 194, 206, 217                                                         |
| Postillons Islands.....                                   | 140                                                                        |
| Pratas Island.....                                        | 137, 138, 141, 158                                                         |
| Preparis Channel.....                                     | 127, 129                                                                   |
| — Island.....                                             | 118, 121, 127, 128, 129                                                    |
| Priaman Island.....                                       | 40                                                                         |
| Prince Island, Channel of.....                            | 98, 99, 136                                                                |
| Prince of Wales Channel.....                              | 193, 194, 198, 206, 221, 223                                               |
| — — — Islands.....                                        | 191, 192, 194                                                              |
| — — — —, Directions from west to east, in Channel of..... | 194                                                                        |
| — — — —, Routes from east to west, in Channel of.....     | 206                                                                        |
| — — — —, Island.....                                      | 121, 123, 129, 131                                                         |
| Prince Regent, reefs and bank.....                        | 201                                                                        |
| Printian Island, <i>see</i> Pulo-Printian.                |                                                                            |
| Providence Island.....                                    | 224                                                                        |
| Pulicat Road.....                                         | 123                                                                        |
| Pulo-Aor, currents near.....                              | 86                                                                         |
| — Island.....                                             | 136, 137, 138, 149, 150, 151, 152, 159, 160, 161, 169, 171                 |
| — — —, N. E. monsoon, interior route from Macao to.....   | 148, 149                                                                   |
| — — —, N. E. monsoon, from Manilla to.....                | 171                                                                        |
| — — —, Outer route from Macao to.....                     | 150, 151                                                                   |
| Pulo-Bessy, Channel of.....                               | 98, 99                                                                     |

|                                                           | Page.                                                     |
|-----------------------------------------------------------|-----------------------------------------------------------|
| Pulo-Bouton Island, Strait of Malacca .....               | 121, 123                                                  |
| Pulo-Brala Island .....                                   | 169                                                       |
| Pulo-Brasse Island .....                                  | 116, 117, 124, 130                                        |
| Pulo-Cambing Island .....                                 | 168, 189                                                  |
| Pulo-Canton Island .....                                  | 142                                                       |
| Pulo-Ceicer de Mer Island .....                           | 163, 150, 151                                             |
| Pulo-Ceicer de Terre Island .....                         | 149, 150                                                  |
| Pulo-Condore Island .....                                 | 62, 137, 163                                              |
| Pulo-Docan Island .....                                   | 165                                                       |
| Pulo-Gass Island .....                                    | 145, 157                                                  |
| Pulo-Jaki Island .....                                    | 190                                                       |
| Pulo-Lantinga Island .....                                | 169                                                       |
| Pulo-Laut Islands .....                                   | 56, 139, 140, 155                                         |
| Pulo-Leat Island .....                                    | 160                                                       |
| Pulo-Malora Island .....                                  | 116, 124                                                  |
| Pulo-Mancap Island .....                                  | 158, 159, 165                                             |
| Pulo-Mintao Island .....                                  | 40                                                        |
| Pulo-Oby, Currents near .....                             | 87                                                        |
| — Island .....                                            | 62, 161, 170                                              |
| Pulo-Panjang Island .....                                 | 169, 170                                                  |
| Pulo-Pera Island .....                                    | 132                                                       |
| Pulo-Pisang Island .....                                  | 145, 157                                                  |
| Pulo-Popo Island .....                                    | 143, 157                                                  |
| Pulo-Printian Island .....                                | 169                                                       |
| Pulo-Rondo Island .....                                   | 117                                                       |
| Pulo-Sapata Island .....                                  | 61, 137, 147, 150, 151, 152, 159, 162, 163, 164, 170, 171 |
| —, Route from Macao to Pulo-Aor; passing to east of ..... | 150, 151                                                  |
| Pulo-Sinkep Island .....                                  | 165                                                       |
| Pulo-Taya Island .....                                    | 151, 160, 165                                             |
| Pulo-Timoan Island .....                                  | 62, 63, 137, 151, 164, 169                                |
| Pulo-Toty Island .....                                    | 159                                                       |
| Pulo-Varela Island .....                                  | 169                                                       |
| Pulo-Way Island .....                                     | 39, 116, 117, 121, 124, 130, 169                          |
| Pylades Rock .....                                        | 175                                                       |
| Pyramid Island .....                                      | 149                                                       |

## Q.

|                         |     |
|-------------------------|-----|
| Quilon Fort .....       | 90  |
| Quinilaban Island ..... | 153 |

## R.

|                                                                                                       |                                             |
|-------------------------------------------------------------------------------------------------------|---------------------------------------------|
| Raine Island, Beacon .....                                                                            | 208, 209                                    |
| — Island .....                                                                                        | 199, 208, 209, 210, 211, 215, 219, 221, 222 |
| — —, Channel or Passage .....                                                                         | 194, 190, 199, 209, 210, 222                |
| — —, Directions for the routes leaving Cape York to leave<br>the Great Barrier by the passes of ..... | 198, 199                                    |
| — —, Directions coming from eastward to traverse the<br>Great Barrier by the passes of .....          | 209, 210, 211                               |
| — —, Anchorage of .....                                                                               | 209                                         |
| — —, Passes of .....                                                                                  | 180, 199, 207, 209, 210, 213, 214, 215, 221 |

|                                                            | Page.                                                           |
|------------------------------------------------------------|-----------------------------------------------------------------|
| Raine Island, Reef.....                                    | 209                                                             |
| Rangoon.....                                               | 127, 128, 131, 154                                              |
| —, Route from Nicobar Island and Strait of Malacca to..... | 127                                                             |
| —, Routes from east coast of Gulf of Bengal to.....        | 127                                                             |
| Ras-Amran, Cape.....                                       | 157                                                             |
| Ras-Asew, Cape, <i>see</i> Gardafui.                       |                                                                 |
| Ras-el-Gat, Cape, or Ras-el-Hadd.....                      | 11, 14, 17, 111, 112, 113                                       |
| Ras-Fartak, Cape.....                                      | 13                                                              |
| Ras-Hafoon, Cape, <i>see</i> Orfui.                        |                                                                 |
| Ras-Jask, Cape.....                                        | 112, 114                                                        |
| Ras-Karwan, Cape.....                                      | 11                                                              |
| Ras-Rhemat, Cape.....                                      | 9                                                               |
| Ras-Seger, Cape.....                                       | 11                                                              |
| Rechado, Cape.....                                         | 38                                                              |
| Recherche Archipelago.....                                 | 44                                                              |
| Recif, Cape.....                                           | 102                                                             |
| Red Bay Anchorage.....                                     | 174                                                             |
| — Sea.....                                                 | 9, 13, 15, 17, 101, 102, 107, 108, 109, 110, 111, 112, 113, 125 |
| — —, Currents in.....                                      | 75                                                              |
| — —, Departure from.....                                   | 109, 110                                                        |
| — —, Straits of.....                                       | 108, 109                                                        |
| — —, Route from Bombay to.....                             | 105, 106, 107                                                   |
| — —, Route from Cape of Good Hope to.....                  | 92                                                              |
| — —, Route from Mahé to.....                               | 107, 108                                                        |
| — —, Route from west coast of India to.....                | 105, 106, 107                                                   |
| — —, Southern route from east coast of India to.....       | 126                                                             |
| — —, Routes from east coast of India to.....               | 108                                                             |
| — —, Southern routes from Bombay to.....                   | 112, 113, 114                                                   |
| — —, Winds in.....                                         | 10, 11                                                          |
| Redang Islands.....                                        | 161, 169, 170                                                   |
| Reef Islands.....                                          | 174                                                             |
| Rees Islands.....                                          | 173                                                             |
| Rendezvous Island.....                                     | 166                                                             |
| Rennel Island.....                                         | 217, 218                                                        |
| Restoration Island and Cape.....                           | 204                                                             |
| Réunion Island.....                                        | 46, 47, 71, 92, 94, 104, 105, 127                               |
| —, Route from Cape of Good Hope to Island of.....          | 94                                                              |
| —, Winds on coast of Island of.....                        | 46, 47                                                          |
| Rhemat, Cape, <i>see</i> Ras-Rhemat.                       |                                                                 |
| Rhio Strait.....                                           | 166                                                             |
| Rivers, Cape.....                                          | 154                                                             |
| Rodney, Cape.....                                          | 196                                                             |
| Rodriguez Island.....                                      | 46, 47, 71, 72, 105                                             |
| —, Winds on the coast of.....                              | 46, 47                                                          |
| Roma Island.....                                           | 168                                                             |
| Romania Pt.....                                            | 204                                                             |
| Rondo Island, <i>see</i> Pulo-Rondo.                       |                                                                 |
| Rook Island.....                                           | 101, 167, 168, 182, 183, 224                                    |
| Rotti Strait.....                                          | 182                                                             |

|                             | Page. |
|-----------------------------|-------|
| Royal Captain Shoal .....   | 138   |
| Royal Charlotte Shoal ..... | 138   |
| Rusa-Raji Island .....      | 168   |

## S.

|                                                     |                                                  |
|-----------------------------------------------------|--------------------------------------------------|
| Sahul Banks .....                                   | 167, 182                                         |
| Saint Andrew's Island .....                         | 156, 157                                         |
| Saint Augustine Bay .....                           | 90                                               |
| Saint Esprit Island .....                           | 160                                              |
| Saint George's Channel .....                        | 223, 224                                         |
| —, Cape .....                                       | 223                                              |
| Saint John, Cape .....                              | 17                                               |
| — — Island .....                                    | 87, 137                                          |
| — —, Mount .....                                    | 90, 110, 114                                     |
| Saint Julien Island .....                           | 159, 160                                         |
| Saint Matthew Islands, Sea of Banda .....           | 168                                              |
| Saint Paul Island .....                             | 89, 97, 99                                       |
| Saint Barbe Island .....                            | 159, 160                                         |
| Saint Mary, Cape .....                              | 5                                                |
| Salanga Island, <i>see</i> Junk Ceylon.             |                                                  |
| — Island .....                                      | 158, 183                                         |
| Salayer Strait .....                                | 101, 141, 142, 157, 158, 185, 187, 188, 189, 191 |
| Solomon Islands .....                               | 147, 225                                         |
| Samar Island .....                                  | 226                                              |
| Samboangan, Port .....                              | 168                                              |
| San Bernadino Strait .....                          | 227                                              |
| Sandal Wood Island .....                            | 101, 143, 163, 182                               |
| Sandy, Cape .....                                   | 178, 179, 200                                    |
| — Island .....                                      | 204                                              |
| Sangboy Islands .....                               | 168                                              |
| Sangir Island .....                                 | 141                                              |
| Santa Cruz Islands .....                            | 225                                              |
| Sapata Island, <i>see</i> Pulo-Sapata.              |                                                  |
| Sapy Strait .....                                   | 135, 140, 142, 157, 158                          |
| —, Remarks on Strait of .....                       | 100, 101                                         |
| —, Eastern route for the Strait of .....            | 89                                               |
| —, Winds in the Strait of .....                     | 55                                               |
| Satellite Rock .....                                | 203                                              |
| Sauger Bank .....                                   | 118                                              |
| — Channel .....                                     | 119                                              |
| Savu Island .....                                   | 101, 156, 168                                    |
| Sayade Malha Bank .....                             | 92                                               |
| Sayer Islands .....                                 | 122                                              |
| Scarborough Shoal .....                             | 158                                              |
| Scinde, Coast of .....                              | 17, 110                                          |
| Sea Cow Island, <i>see</i> Bird Island.—Seychelles. |                                                  |
| Sea-Horse Bank, <i>see</i> Half Moon Bank.          |                                                  |
| Sedano, Cape .....                                  | 159                                              |
| Segez, Cape, <i>see</i> Ras-Seger.                  |                                                  |
| Selle Islands .....                                 | 16                                               |

|                                                                                     | Page.                               |
|-------------------------------------------------------------------------------------|-------------------------------------|
| Serangani Islands.....                                                              | 141, 168                            |
| Seuhilipar Island.....                                                              | 107, 110                            |
| Seven Islands Islands.....                                                          | 151                                 |
| Seychelles Islands.....                                                             | 92, 94, 113, 126, 134               |
| Seyer Islands, <i>see</i> Sayer Islands.                                            |                                     |
| Shadwell Point.....                                                                 | 199                                 |
| Shanpee Islands.....                                                                | 146                                 |
| Shemaal Winds.....                                                                  | 15, 16, 76                          |
| Sherrard Islands.....                                                               | 204                                 |
| Shoal, Cape.....                                                                    | 206                                 |
| Siam, Currents at entrance of the Gulf of.....                                      | 86                                  |
| —, Currents in Gulf of.....                                                         | 87                                  |
| —, Gulf of.....                                                                     | 161, 163, 164                       |
| —, Navigation of the Gulf of.....                                                   | 169, 170                            |
| —, River.....                                                                       | 169                                 |
| —, Winds in the Gulf of.....                                                        | 62, 63                              |
| Siao Island.....                                                                    | 141                                 |
| Sibbootoo Island.....                                                               | 154                                 |
| Sidmouth, Cape.....                                                                 | 204                                 |
| Simao Strait.....                                                                   | 167                                 |
| — Island.....                                                                       | 156                                 |
| Sinai, Mount.....                                                                   | 10                                  |
| Singapore, N.W. Monsoon, East route from eastern straits to...                      | 166                                 |
| —, In N.W. Monsoon, Southern route from eastern straits to...                       | 166                                 |
| —, Strait of.....                                                                   | 38, 61, 87, 136, 147, 152, 158, 159 |
| —, End of S.E. Monsoon, by Carimata Passage, from eastern straits to.....           | 165, 166                            |
| —, Port.....                                                                        | 164, 165, 166, 184                  |
| Single Island.....                                                                  | 172                                 |
| Sinkep Island, <i>see</i> Pulo-Sinkep.                                              |                                     |
| Sisters Islands, China Sea.....                                                     | 170                                 |
| — Islands, Torres Strait.....                                                       | 195, 198, 217, 218                  |
| Socotra Island, or Socotora.....                                                    | 12, 106, 107, 108                   |
| Sofala Bay.....                                                                     | 5                                   |
| Solombo Islands.....                                                                | 158                                 |
| Sombrero Channel.....                                                               | 130, 132                            |
| Sooloo Islands.....                                                                 | 138, 140, 154, 166                  |
| —, Sea of.....                                                                      | 54, 154, 162, 225, 226              |
| —, Winds in Sea of.....                                                             | 58                                  |
| Sunda, Currents between Islands of.....                                             | 85                                  |
| —, Strait of, 40, 55, 56, 98, 133, 134, 135, 136, 139, 141, 147, 148, 154, 160, 165 |                                     |
| —, Islands of.....                                                                  | 41, 42, 100, 183                    |
| —, Remarks on the Strait of.....                                                    | 98, 99                              |
| —, Direct route from Cape of Good Hope to Strait of.....                            | 89, 97, 98                          |
| —, Route from the Coromandel Coast to the Strait of.....                            | 133, 134                            |
| —, Winds at the Islands of.....                                                     | 40, 41                              |
| Surabaya, Port.....                                                                 | 166                                 |
| Sourouton Island.....                                                               | 159, 185                            |
| Speaker Bank.....                                                                   | 108, 113, 126                       |
| Spermonde Island.....                                                               | 140                                 |
| Stead's Passage.....                                                                | 212, 213, 219, 220, 221, 222        |

|                                        | Page.                                                                                   |
|----------------------------------------|-----------------------------------------------------------------------------------------|
| Stead's Passage, Remarks on .....      | 220                                                                                     |
| Stephens Island .....                  | 196, 218                                                                                |
| Strait, Rock .....                     | 206                                                                                     |
| Subban, Mounts .....                   | 12                                                                                      |
| Sue, Island of .....                   | 218                                                                                     |
| Suez, Sea of .....                     | 10                                                                                      |
| —, Town of .....                       | 10                                                                                      |
| Sumatra, Currents near .....           | 84, 85                                                                                  |
| —, Island of .....                     | 4, 37, 38, 39, 40, 96, 98, 99, 105, 124, 125, 129, 131, 132,<br>133, 136, 139, 166, 182 |
| —, Winds on the west coast of .....    | 38, 39, 40                                                                              |
| Sumatras, Winds .....                  | 38, 166                                                                                 |
| Sumbawa Island .....                   | 100, 158, 168                                                                           |
| Sunday Island .....                    | 205                                                                                     |
| Surat, Passage or Strait of .....      | 116, 124                                                                                |
| —, Port of .....                       | 18, 90; 106, 110, 115                                                                   |
| Surigao, Strait of, <i>see</i> Panaon. |                                                                                         |
| Syang Island .....                     | 146, 157                                                                                |
| Sydney .....                           | 181, 182, 190, 199, 200, 207, 217, 218, 220                                             |

## T.

|                                         |                            |
|-----------------------------------------|----------------------------|
| Tabo, Cape .....                        | 145                        |
| Tagolanda Island .....                  | 141                        |
| Tanakeke Island .....                   | 140                        |
| Tanasserino, Coast of .....             | 35, 36, 122, 129           |
| —, Winds on the coast of .....          | 35, 36                     |
| Tanna Island .....                      | 226                        |
| Tanore .....                            | 125, 132                   |
| Tas de Foin, Islet of .....             | 171                        |
| Tasmania Island, <i>see</i> Van Diemen. |                            |
| Tawally Island .....                    | 155                        |
| Tawee-Tawee Island .....                | 154                        |
| Taya Islands .....                      | 148, 161                   |
| Tellechery Road .....                   | 90                         |
| Tempestades, Gales .....                | 66                         |
| Ten Degrees Channel .....               | 117, 121, 130, 131, 132    |
| Thousand Islands, Group .....           | 141                        |
| Three Chimneys, Islets .....            | 174, 175                   |
| Three Islands Islands .....             | 202                        |
| Three Mile Pass, First and Second ..... | 219                        |
| Three Rocks .....                       | 201                        |
| Tiger Island .....                      | 172                        |
| Tikopia Island .....                    | 226                        |
| Timoan Island, <i>see</i> Pulo-Timoan.  |                            |
| Timor Island .....                      | 41, 42, 100, 156, 167, 168 |
| —, Sea of .....                         | 167, 183                   |
| —, Winds on the coast of .....          | 41, 42                     |
| —, Winds in the Sea of .....            | 4, 59                      |
| Ti-Sami Bay .....                       | 173                        |
| Tong-Boo Cape .....                     | 174                        |

|                                                             | Page.                                       |
|-------------------------------------------------------------|---------------------------------------------|
| Tong-Yang Island.....                                       | 175                                         |
| Tonga Islands.....                                          | 47                                          |
| Tong-Sang Bay, <i>see</i> Tung-Sham.                        |                                             |
| Tonquin Gulf.....                                           | 87, 161                                     |
| —, Navigation in Gulf of.....                               | 171, 172                                    |
| — River.....                                                | 171, 172                                    |
| —, Winds in Gulf of.....                                    | 63, 64                                      |
| Tongu Island.....                                           | 140                                         |
| Toojoo Island, <i>see</i> Seven Islands.                    |                                             |
| Toor Mount.....                                             | 10                                          |
| Torres Strait.....                                          | 4, 59, 60, 176, 177, 178, 179-222           |
| —, Periods for traversing the Strait of.....                | 207                                         |
| — Islands.....                                              | 130                                         |
| —, Navigation in Strait of.....                             | 179-222                                     |
| —, Route of the <i>Astrolabe</i> and <i>Zélée</i> .....     | 216, 217                                    |
| — Outer route by Bligh Channel, from Sidney to Strait of... | 217, 218                                    |
| —, Outer route from Sidney to Strait of.....                | 179, 180, 181, 207, 216                     |
| —, Inner route from Sidney to Strait of.....                | 179, 180, 181, 200-207                      |
| —, Routes by the Prince of Wales Channel to Strait of.....  | 206                                         |
| —, Routes from China Sea to Strait of.....                  | 183                                         |
| —, Routes from Indian Ocean to Strait of.....               | 182, 183                                    |
| Toty Island, <i>see</i> Pulo-Toty.                          |                                             |
| Toud Island, or Warrior Island.....                         | 217                                         |
| Toukan-Bessy Islands.....                                   | 142, 157                                    |
| Trade-winds.....                                            | 1, 2                                        |
| Traitor's Islands.....                                      | 224                                         |
| Traverse, Current, <i>see</i> counter-current of the Cape.  |                                             |
| Treacherous Bay.....                                        | 196                                         |
| Tribulation, Cape.....                                      | 202                                         |
| Trieste Island.....                                         | 98, 133                                     |
| Trincomalee Road.....                                       | 22, 95                                      |
| Trio Rocks.....                                             | 175                                         |
| Talur Islands.....                                          | 141                                         |
| Tung-Shan Bay.....                                          | 173                                         |
| Turn-About Island.....                                      | 174                                         |
| Turon, Cape.....                                            | 161                                         |
| Turtle Island.....                                          | 199                                         |
| — Islands and Reef.....                                     | 202, 203                                    |
| Ty-Cham Rocks, <i>see</i> Pedro Blanco.                     |                                             |
| Typhoons, Observations on.....                              | 67, 68                                      |
| —, Tempests.....                                            | 64, 65                                      |
| U.                                                          |                                             |
| Usang, Point.....                                           | 154                                         |
| Urk Island.....                                             | 168                                         |
| V.                                                          |                                             |
| Valpeni Island.....                                         | 107                                         |
| Van Diemen Island.....                                      | 1, 45, 46, 70, 136, 146, 147, 178, 224, 225 |
| Vansittart Shoal.....                                       | 160                                         |

|                                   | Page.                  |
|-----------------------------------|------------------------|
| Varela, Cape.....                 | 63, 148, 149, 150, 159 |
| —, False Cape.....                | 149, 150               |
| — Island, <i>see</i> Pulo-Varela. |                        |
| Vele-Rete Rocks.....              | 145                    |
| Velthoens Island.....             | 168                    |
| Victoria Rock.....                | 190                    |
| Victory Island.....               | 159, 160               |
| Village Island.....               | 218                    |
| Vine Reef.....                    | 179                    |
| Vizagapatam Road.....             | 116                    |

## W.

|                                                           |                              |
|-----------------------------------------------------------|------------------------------|
| Waigion Island, <i>see</i> Waygiou.                       |                              |
| Wallis Island.....                                        | 183, 191, 192, 193, 194, 206 |
| — —, Tides at.....                                        | 198                          |
| Warrior Island.....                                       | 217                          |
| Watcher Island.....                                       | 141                          |
| Water Island, River-Canton, <i>see</i> Chung-Chow Island. |                              |
| — Island, Coast of Cochin-China.....                      | 149                          |
| Way Island, <i>see</i> Pulo-Way.                          |                              |
| Waygiou Island.....                                       | 143, 146                     |
| Wednesday Island.....                                     | 194, 206, 218, 222           |
| Welps Islands.....                                        | 175                          |
| Wetta Island.....                                         | 156, 168                     |
| Weywongy Island.....                                      | 142                          |
| White Dogs Islands.....                                   | 173, 175                     |
| White Weather season.....                                 | 59                           |
| Widda Islands.....                                        | 145                          |
| Wilson Promontory.....                                    | 45                           |
| Winter Passage.....                                       | 219                          |
| Woody Islands.....                                        | 192, 221                     |
| Wreck Bay.....                                            | 213                          |
| — Reef.....                                               | 207, 208, 218, 223           |

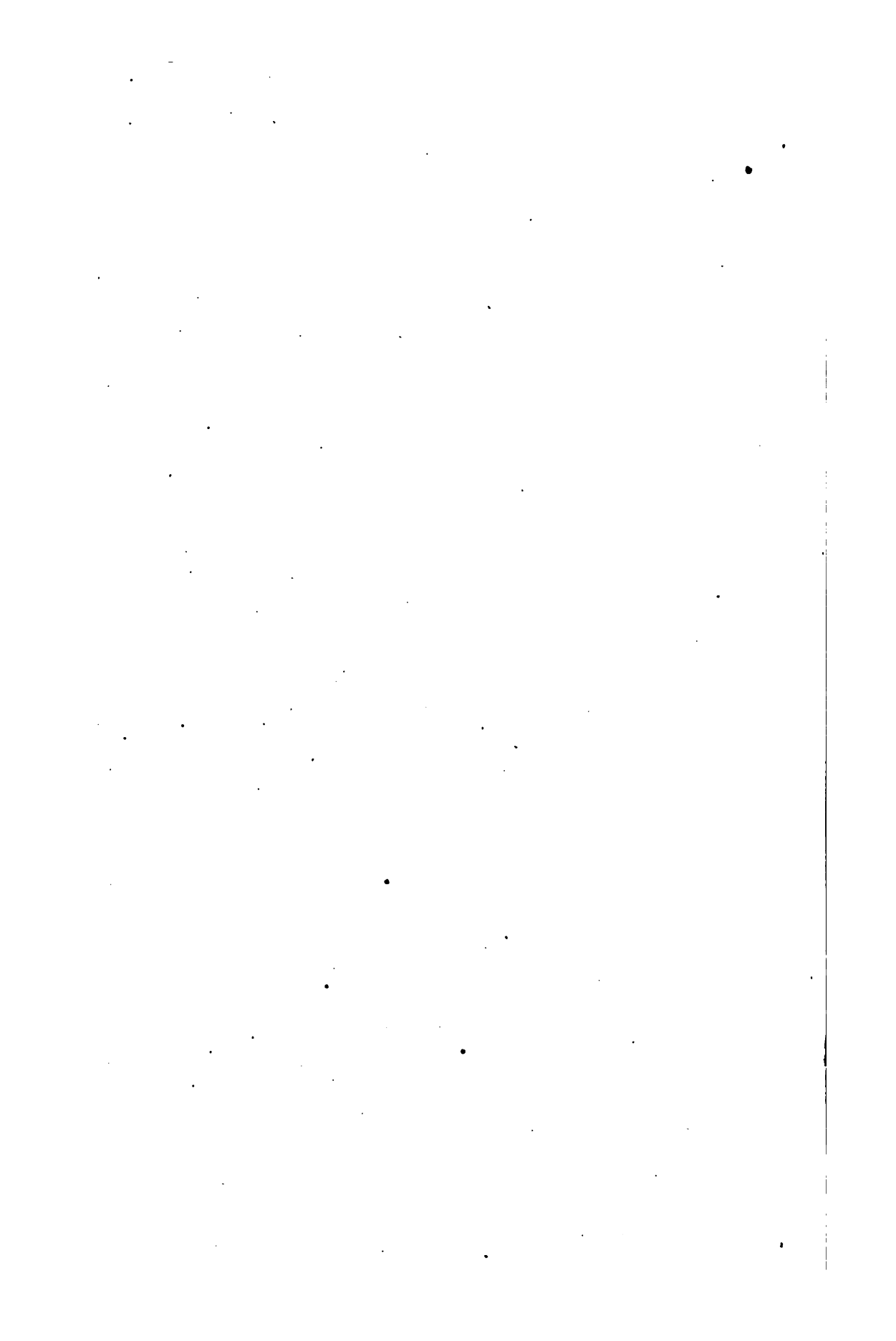
## X.

|                           |          |
|---------------------------|----------|
| Xulla-Bessy Island.....   | 142, 143 |
| Xulla-Talyabo Island..... | 155      |

## Y.

|                        |                                           |
|------------------------|-------------------------------------------|
| York, Cape.....        | 4; 180, 193, 194, 198, 199, 205, 214, 222 |
| —, Cape, Tides at..... | 198                                       |
| — Island.....          | 199                                       |
| Yule Pass.....         | 214, 219                                  |





1

2

3

4

5













CONSERVED  
ARP 5/2005  
HARVARD COLLEGE  
LIBRARY





